Meeting Minutes of the Measuring Innovation in the 21st Century Economy Advisory Committee
February 22, 2007

The first meeting of the Measuring Innovation in the 21st Century Economy Advisory Committee was held on Thursday, February 22, 2007, at 2:00 p.m. The meeting was held in the Vista Ballroom of the Wyndham Washington Hotel, 1400 M St. NW. Washington, DC 20009-2750.

The following advisory committee members were present at the meeting:

Carl Schramm, Chair
Ashish Arora
David L. Bernd
James Blanchard
Rajesh Chandy
Art Collins
Kathleen Cooper
Michael Eskew
Luther Hodges
Dale W. Jorgenson
John Menzer
Samuel J. Palmisano
Donald Siegel

The following Department of Commerce officials were present and participated in the meeting:

Carlos Gutierrez, Secretary of Commerce
David Sampson, Deputy Secretary of Commerce
Cynthia A. Glassman, Under Secretary for Economic Affairs
Elizabeth E.R. Anderson, Deputy Under Secretary and Designated Federal Officer
Patricia Buckley, Executive Director

The attached transcript accurately describes each matter that was discussed by the Advisory Committee at the meeting.

These minutes are certified as true and correct.

Carl J. Schramm
Advisory Committee Chair

April 30, 2007
Date

Transcript of Measuring Innovation in the 21st Century Meeting on February 22, 2007

BEGINNING OF TAPE

SECRETARY GUTIERREZ: Good afternoon. If I can have your attention, I'd like to welcome the members of the advisory committee and thank all of you for your time and your willingness to serve, and especially your willingness to take on what we think is a complex but very important challenge, which is how do we measure innovation for the U.S. economy.

We had originally called this group the Innovation Metrics Advisory Committee, but that didn't sound innovative enough so it's now the Measuring Innovation in the Twenty-first Century Economy Advisory Committee. So, welcome to the first meeting.

We all know that innovation is taking on increasing importance in the economy as we move toward higher value manufacturing. As we move toward more knowledge-oriented service industries, and the whole world has jumped into the competition, differentiating a company, a product, a service has become more important than ever, and innovation, of course, is a driver of that differentiation. So this meeting could not be more timely, and we believe that the work of this committee will have a lasting impact on our economy and our ability to continue to compete in what is increasingly a very competitive world-wide environment.

What we're asking you to do is to use your experience, your knowledge, and your skills to help us develop a measure or a set of metrics that will enable us to determine how effective we are being at the task of innovation as an economy. We all know that we've been able to measure tangible activities. We can measure assets. We can measure a lot of very specific events. But, the subject of innovation is one that I think individually most companies measure, but we have not been able to develop a measure on a macro-economic level. That is our challenge. So I can't thank you enough for your willingness to do this.

We've tried to keep this as simple as possible, and we have decided to focus on the metric. So, the challenge is: how do we measure if we are innovating as an economy, as opposed to what policies do we need to put in place in order to innovate. So it is all about the measurements and, in order to focus on that, we will avoid getting stuck in policy.

I would ask that we focus on using all the brain power in the committee to think about how we can measure whether we—as an economy—are innovating, whether we are driving our economy through innovation, and over time we'll be able to see whether policies are driving our ability to innovate.

We had a discussion a little while ago where it was mentioned that those companies that measure a lot of things tend to be more innovative because measurements drive activity, and in order to hit certain measures and certain targets, you have to be innovative. I think that's a great starting point for this committee.

Whatever we decide to measure will ultimately be something that drives the whole economy. I look forward to the day when we are receiving quarterly economic updates, and one of those numbers that we look at in addition to GDP, in addition to inflation, in addition to employment, happens to be the innovation metric that we've developed in this committee.

So, your work will have enduring impact on our economy, and again I thank you all for your service, for your willingness to take this on. And I can assure you that your work will have an impact and ultimately that is what we all would like. So thank you for being here. I'm going to pass it on to Cynthia Glassman, and she will take us to the next item on the agenda. Thank you again for your willingness to serve. Thank you.

UNDER SECRETARY GLASSMAN: Thank you Mr. Secretary. As Under Secretary for Economic Affairs I also want to thank all of you for serving on this committee. You've taken on a very challenging task, and I know we are going to benefit greatly from your advice.

As we were preparing for the meeting, we spoke with each committee member. The scholarly work done by the academic members has been extremely valuable, and we feel confident that we are learning from and building on this work of these distinguished committee members. The discussions of the business members were also extremely enlightening, as were the visits to several of the members' facilities, where we saw first-hand how new ideas are developed and implemented. What we heard helped us work with our chairman to shape today's discussion. Although we have a variety of industries represented here today, we identified several common themes.

First, these most innovative companies do measure many things. Much of the innovative, innovation-related measurement is project driven. You all seem to have metrics to determine if a new product or process is a success. You all know how to measure productivity, but we didn't hear about any company-wide metrics for innovation. It's clear as a result that you all understand the challenges to measurement that we're all facing here on the committee.

Second, we heard that corporate culture and the tone set from the CEO are critical. We heard to a company the importance of risk taking and having the proper incentives to encourage new ideas. As important, your companies learn from ideas that are not successful.

In addition, although we didn't ask about obstacles to innovation, we heard a good deal about them. Sarbanes-Oxley, Section 404, immigration restrictions and the need for skilled workers, among other topics, were noted frequently as impediments to innovation.

These are issues that concern us deeply, but they are not the focus of today's meeting. Most important for today, as the Secretary said, is your discussion about how to measure innovation in a way that can be rolled up to measure innovation for the economy as a whole.

With that, let me go around the table and introduce the participants in this discussion. And, I would note for the audience, our complete bios are available on the document table. Starting from my right—in case you hadn't noticed it's in alphabetical order; there's no other method to this order than the alphabet:

Ashish Arora, Professor of Economics and Public Policy at the H. John Heinz III School of Public Policy and Management at Carnegie Mellon University.

Next is David Bernd, CEO of Sentara Healthcare in Norfolk, Virginia.

Next is Jimmy Blanchard, the very recently retired Chairman of the Board and CEO of Synovus Financial Corporation in Columbus, Georgia.

Then Rajesh Chandy, the Carlson School Professor of Marketing at the Carlson School of Management, University of Minnesota.

Then Art Collins, who's the Chairman and CEO of Medtronic, a medical technology device company in Minneapolis, Minnesota, which we visited in January when it was very cold.

Next is Kathy Cooper, Dean of the College of Business at the University of North Texas. She preceded me in this position as Under Secretary for Economic Affairs at Commerce, and prior to that was the Chief Economist at ExxonMobil.

Here at the middle table to my right is E.R. Anderson, Deputy Under Secretary for Economic Affairs and the Designated Federal Official for this advisory committee.

Next is David Sampson, who is the Deputy Secretary of Commerce. His prior roles include Chair of the Texas Council on Workforce and Economic Competitiveness, and in the private sector, President and Chief Executive Officer of the Arlington, Texas Chamber of Commerce.

Next to me is Secretary Carlos Gutierrez. Mr. Secretary I hope you will put on your CEO hat today and provide some insight into innovation from your experience as the CEO and Chairman of the Kellogg Company.

To the Secretary's left is the Committee Chairman, Carl Schramm, the CEO and President of the Ewing Marion Kauffman Foundation based in Kansas City.

To Carl's left is Patricia Buckley, the Senior Economic Advisor to the Secretary. As you know, Patricia has worked closely with you and your staffs and, in turn, with the Chairman, to shape today's discussion.

And at the table to my left, we have Mike Eskew, CEO of UPS in Atlanta.

Luther Hodges, Jr. is the owner and manager of Santa Fe Hospitality and Hotel Santa Fe. He is also a former banker and the first Deputy Secretary of Commerce.

Dale Jorgenson is the Samuel W. Morris University Professor of Economics at Harvard.

John Menzer is the Vice Chairman of Wal-Mart stores in Bentonville, Arkansas.

Sam Palmisano is IBM CEO.

And last but not least—because your name starts with S—is Don Siegel, Professor and Associate Dean of the Graduate School of Management at the University of California, Riverside.

Again thank you all for your time and commitment. I also want to thank the people in the audience for attending. Although you won't be able to participate in this discussion, we would appreciate any comments you have. We have a website and we do accept comments. It's: innovationmetrics.gov. And one more request, please turn off all cell phones, BlackBerries, whatever things that will make noise, and with that I will turn the meeting over to our Chairman, Chairman Schramm.

CHAIRMAN SCHRAMM: Thank you, Cynthia and thank you Secretary Gutierrez for calling us together to take up this important topic.

Some of you may have seen one of those Wall Street Journal cartoons recently that showed the abyss of hell and at the bottom there were a set of steps. There was a little building and one fellow at the top of the steps looks over his shoulder and says to the other, my God, it's worse than I thought. At the bottom was a building with a sign over the top that said Eternal Economics Seminar. The devil was shoving people into it.

In some regards, what we're about to take up today is an afternoon of important economic work, but it's the type that most people would have skipped the class today because it's about measurement. But this is very, very important as our economy progresses, and it's important to understand, from a position of humility, how important this topic is today.

Economists are very good at understanding the what. We're not very good at understanding why and how. As innovation becomes more and more important—central, in fact, to what I've described and others have described as the emergence of entrepreneurial capitalism, which hangs on innovation—it is central that we understand not only the why—how it happened—but also the how of what it is.

And this is a topic that is very, very poorly developed in economics. I've shared with all of you a paper that I developed last week that basically is a synopsis of my thinking in this area. Now with the exception of our fellow panelist, Doctor Jorgenson, economists sometimes get things really wrong. In 1968 as I left college, John Kenneth Galbraith published a book called The New Industrial State, and in that book Mr. Galbraith said that all innovation going forward would happen in large industrial laboratories. Just to make sure he didn't get it wrong enough, he declared that the era of the entrepreneur was over.

He was not alone. In the 1990s, even, the greatest of all management gurus, Peter Drucker, wrote also that the entrepreneur would play a smaller and smaller part in the emerging economy.

Now as everyone knows we really have gone through a revolution. Those of you who run large firms appreciate the importance of the efficiency of our economy—that we did not understand in the 70s—to transfer new innovation, reduce risk, to reduce the cost of it, and to get it into the hands of people working in garages have been vital to the expansion of our technology. We understand, increasingly, that people who work in those garages and university laboratories are vital to the development of the new threads of innovation and technology, which in time will be woven into the scale of corporations.

Will Baumol, my co-author on several papers, pointed out that increasingly we have big firm capitalism that is supported by small entrepreneurial firms. We are essentially re-inventing the American economy as a web in which innovation is the common vocabulary.

I think it's important that as we take up our talk today that we focus on one fundamental principle, which is often lost. It's the first thing people really understand when they move into management. That is, if you can't measure it, you can't manage it.
As our economy becomes more and more and more dependent on innovation, and we understand that—in terms of just establishing and maintaining our position in the world and all that hangs from America's economic leadership in terms of freedom and democracy, and world security—this question is actually emerging as the central question. How does the American economy continue to be innovative at rates that appear to be faster than other economies?

What I've tried to do in just these opening remarks is try and buffer us from the sense that what we're doing here is sort of knitting around small questions in the realm of economics. We in fact have been asked by the Secretary to take up a very, very difficult question, and one of central importance. And, that is how do we measure innovation and how do we measure it in terms that will be approachable and usable by policy makers, by people who run businesses, by people who look to the American economy and try to measure their own economies against it. This is a central question.

Now, we're going to treat this question at our first meeting by actually talking first about what it is, and that obviously is the predicate to measuring it. If we can't manage it by measuring it, if we don't know what it is, we will get the measurement wrong.

And then, after we talk on this topic for a bit, we're going to have a break and then we actually are going to apply ourselves to the question of how it is that we go about measuring innovation.

And the way we've planned the afternoon is to have a dialog on both questions serially, and in the first case we're going to ask John Menzer from Wal-Mart to kick it off.

We have a list of people who are pre-designated to talk about this for a few minutes, and then I hope we'll have a general discussion because nobody has a particular province in this question of what it is. All of you have extraordinary perspectives on innovation as you birthed it in your own companies.

As you've seen your own companies change, our academic members have studied this across countries and across companies. The Secretary's brought together a splendid panel of people. Rather than hear more introductory remarks, John it would be great if you could kick off this first half about just what this is.

MEMBER MENZER: Thank you Mr. Chairman.

I wanted to share with this committee examples of process-based innovation at Wal-Mart in the areas of environmental sustainability, prescription drugs, and supply-chain efficiencies. I chose these examples because I believe they illustrate well, how complex, the task is that we actually have in front of us today. That is, how do we appropriately capture all facets of innovation in not just the more easily measurable areas like technology advances, but in other areas that I want to talk about today.

I want to start out with Wal-Mart and sustainabilities. How does Wal-Mart drive innovation in this area? Number one, we do it by setting big stretch goals for the company and for our associates throughout the company. As an example:

Twenty five percent more efficient trucking fleet in three years and even higher than that—double in ten years.

Thirty percent reduction in energy use in new stores in four years.

Reducing solid waste by 20 - 25 percent in three years.

Number two, it's important to realize that we had no plans in place to meet these goals when we set them, but we’re using it to inspire our associates in our company, and really the Wal-Mart community at large to help us get to these type of goals that we've set.

Number three would be creating a business environment that thrives on new ideas or change. We are a company about change. Ideas, for instance, on motion sensors for lights that we have in our refrigerated cases originated this last year within our store managers, and now it's being rolled out to all our new stores.

Number four would be by challenging our supplier base to set individual goals. We create a multiplier effect of ideas that make good business sense, and work toward environmental sustainability, such as ideas like product packaging that we're very focused on today.

The second area I'd like to cover is Wal-Mart and pharmaceuticals. The four dollar generic prescription drug program we introduced last year has been a very big success for us and our customers. Our theme was, we're putting price back in the equation or

really a change in the business market in reducing the co-payment and reimbursement bureaucracy.

So why do we do something like that now? Well, because we developed new solutions-based thinking to drive us in that area. So this is innovation, which is in line with our company goal of helping our working families live better, and we always start all our discussions with the customer.

Lastly I'd like to talk about Wal-Mart and the supply chain efficiencies, which are driven by new insight into supply chain management and technology. Wal-Mart has pioneered many systems and also the theme of sharing data with our suppliers to reduce our merchandise in stocks and improve our store deliveries. Technology really evolves to meet up with our new ideas, such as radio frequency identification, or RFID. That creates even more visibility in the supply chain.

All innovation is geared toward a better consumer experience and better returns for our company.

In conclusion, I presented a very short overview of process-based innovation at Wal-Mart. As you can see, it's a unique marriage of our corporate culture, imagination, and technology. Today it is easier to measure R&D spending as a component of innovation, but I think our challenge is also how to determine—how to quantify—non-technical, intangible aspects of innovation, and I look forward to a very robust discussion of those issues today. Thank you very much.

CHAIRMAN SCHRAMM: Thank you. Jim?

MEMBER BLANCHARD: I was asked to talk about innovation in the sense of something that did not exist before, or prior to the innovation, and the example that I would like to chat briefly about is the formation of a 80 percent owned subsidiary of our banking company, called Total System Services, which is one of the world's largest processors of credit cards all around the world. And you'll see in this story that there's no big bang here as far as the result of innovation. It's a steady path toward the result that can certainly with a backward look be described as innovative.

The journey started in 1959 when our small Georgia bank located only in Columbus, Georgia with no locations outside of our own city, was one of the first banks in the Southeast to issue a credit card. And then, in 1966, we went to Sam's Company and bought some fancy computers and automated our entire operation including the credit card operation where we wrote the program from scratch.

Sam, I guess it was a 360 back then.

MEMBER PALMISANO: You have a good memory. Thank you.

MEMBER BLANCHARD: In 1969 we were the second bank in the Southeast to abandon our private label card and go to what was then a national brand. It was then called Bank Americard. Then in 1970 and 71, Bank Americard automated—

electronified the entire process—and we were the first bank in the United States to go live with the new Base One and Base Two systems.

In 1974 almost as an aside and almost as a joke, we offered to process cards for another bank that was located in St. Petersburg, Florida—then the Landmark Union Trust. And, much to our surprise they called us and accepted. We were not prepared to do it, and yet that was the beginning of Total System.

In 1976, a major judicial decision known as the Worthing Case came down, and the effect of the case was that banks could no longer be limited by the associations to issuing one card or the other, but they were free to issue both and accept deposits from both credit card associations. All of a sudden banks all over the country needed a system, and very few of them had it, and we did.

It began a process of growth that continues today. In 1983—and I gave you this detail because I think it's a classic American enterprise story—we spun off this small operation out of the bank, capitalized it with three million dollars. Six months later we did an IPO and sold 25 percent of it, 21 percent of it for seven and a half million dollars, and today it has a market capitalization of six billion dollars, which represents about half of the market capitalization of 12 million of our entire company. In 1989 we listed it on the New York Stock Exchange.

And then, in the early 90's, we made a decision to completely throw away the old software and re-write our system. It was a major decision. I told the Board that we were going to take three years and spend 30 million dollars. Five and a half years later and 200 million dollars later, we produced the system and fortunately it worked. If it didn't, if it had not worked, I would not be here Mr. Secretary, to make this presentation.

As a result of this new system, the account growth at Total System has been exponential. The leading market share at the time has now shifted to us and we are now the leading Visa Mastercard processor in the U.S. We process now over 400 million credit card accounts all around the world, certainly dominant in the U.S., nearly 80 countries all over West and Eastern Europe, China, Japan, Central and South America, and Mexico.

I hope it didn't bore you. It's a fun story for me to tell, but it's a great story of innovation, creativity, and risk taking.

MEMBER SCHRAMM: Thank you very much.

MEMBER CHANDY: As an academic, part of my role is to learn off of what's been going on out here and elsewhere, and try to highlight things that we could do moving forward.

I want to focus on two elements of this initiative that I think, and a number of folks on the panel of my discussions think, would be important.

One is to highlight and really ensure that we get a sense of the diversity and the richness of the innovation. John Menzer's comments and Jim Blanchard's very inspiring story highlight the diversity and richness of innovation.

One way to look at innovation is in terms of inputs—R&D expenditures—or intermediate outputs—patterns—but then innovation is so much more than that.

We've done a terrific job of, of measuring inputs. But at the end of the day, innovation matters not just because of those inputs or because of those intermediate outputs, but rather the final outputs as well as what one does with those final outputs.

Let me elaborate a little bit on that. Outputs could be in the form of products, of course, but outputs are also processes of the kind John Menzer described, or business models entirely, which involve just multiple elements of the firm.

So in the Wal-Mart drug pricing context, it's certainly a pricing innovation—a rather dramatic one relative to what existed before—but what's underlying that is just changes throughout the organization and other organizations that John was describing, just how much of the processes inside of the organization needed to be changed for such a simple—actually that's part of the beauty of the product—innovation to be created.

So internal processes as well external, for instance with the Government, interactions with governments et cetera, so the diversity of innovation, looking at going beyond inputs and looking at the many dimensions of innovation is important.

Also, this differentiating between the incremental innovations that are necessary on a year-to-year, month-to-month basis and the truly radical innovation that transform not only firms, but entire industries.

These are the innovations that are responsible in many ways for our standard of living in this country and these are also innovations that are pretty exciting.

And they're exciting because these are the kinds of innovations that make possible inspiring stories like Jim Blanchard’s where there's a surge of excitement because suddenly creative individuals see possibilities that didn't exist before, and it's based on activities that happen not just at small firms, of course they do, but also large firms like at IBM and there's a surge of market of entry into the market by a lot of people who either came up with the idea concurrently, or see their colleagues or competitors entering in and so there's a surge of entry followed by death and destruction.

Because virtually all of these major innovations lead to great excitement, and therefore much entry followed by just shakeouts, and the few firms that remain, those are the firms that actually may capitalize on those innovations.

So clearly all of those firms had a role to play, but the ones that remain are the ones that transform our lives.

What would be useful, therefore, in our discussions would be all to look at this pattern of entry and exit.

In my experience and existing research, it looks like Mount Everest, you know. So entry is going up and then just devastation.

And the entrance, the first entrants often are not around by the time the payouts happen, and the first entrants could well be a large incumbent, or it could be small entrepreneurial firms, and they could be very different from the profile of the firms that have the wherewithal, either as small firms become strong enough to go throughout the economy or as large firms remain nimble and entrepreneurial enough to embrace this very real change.

So just to summarize then, I hope we'll get at the richness of innovation across all of its dimensions, that's no easy task, and also I hope we'll get a comprehensive view of the sources of innovation in terms of entry and exit.

CHAIRMAN SCHRAMM: Thank you. Mike.

MEMBER ESKEW: When I think about innovation, I think about a hundred year old company. This year, UPS celebrates its centennial. It's a story about transformation from a Seattle messenger company, that over the years transformed itself from a delivery company from the stores of Seattle, to a ground company, to an air company, to an international company, to a supply-chain company, and—now even since commerce has changed—to largely a technology company.

As we think about those transformations, I think a lot about the process of transformation and how we think about how we transform and how we innovate in that process. Normally, I do this on a white board, so let me do this on a virtual white board, if you will, that it is in four quadrants—two at the top and two at the bottom.

When I think about the two at the top, those are things we do in our core businesses. The two at the bottom are the ones that are non-core businesses. When I think about the vertical, the ones on the left are things we develop and innovate internally and the ones on the right are things we innovate externally. Let's go quadrant by quadrant and I'll tell you how we think about innovation and the process of innovation.

In that top left quadrant, where we innovate for the core internally—we do that like a lot of companies and we need to think about how we keep those quadrants healthy. We do that through our product process—through our marketing committee—and they think about what's the next thing that we do for our core business. What's the next type of service? What's the next product? How can that hit the market? What kind of acceptance will that have in the market? Our marketing committee thinks about that and we roll that through the process of how we can build it—design it and build it and do all the things we need to do.

The quadrant to the right is also in the core, but developed externally—largely it comes from outside sources. It comes from what the customers say they need. You need to

have a conduit to listen to customers—in terms of demands and what they need. It's also from acquisitions we make. We learn from the outside. It's from partners we have around the world. What are the needs of the market?

Those are things for the core.

The bottom side is when we think about non-core. When I think about non-core, these are areas where we can try things and we can fail. Hopefully, we can fail small fast. Sometimes, we fail big, longer, but you want to fail small, fast on these bottom two quadrants.

What we do for the non-core—for internally—we have a strategy group. They think about the next adjacencies—supply chain, distribution, technologies, freight supply chain logistics. We've looked at things like grocery delivery. We've looked at a lot of different things. What is adjacent to the core that perhaps we can develop internally?

And, that bottom right quadrant in the process of innovation…we think a lot about non-core externally. We use a strategic enterprise fund—Sam, much like you do at IBM. It's a fund of pre-IPO venture companies to think about things like RFID, or think about things like materials, to think about things like e-commerce and how e-commerce will touch the world. We also use universities—how universities think about new things externally that may affect our business in the non-core areas.

Keeping those four separate quadrants—all where innovation occurs, all of which need to be healthy—moving is the process by which we think about the innovation.

As we spoke about over lunch though—and what John Menzer said—is the big part about innovation. We measure everything. When you measure things and you set big goals—even from simple areas and say we want to go from here to here—those big goals can't be accomplished without innovation. We think about what are the barriers between this point and that point and what do we have to do to remove them. When you measure everything that moves every day you also find ways to innovate.

So that's the way we think about the process of innovation.

CHAIRMAN SCHRAMM: Thanks, Mike. Ashish.

MEMBER ARORA: Let me begin with a story. I asked a question to my class. I don't remember the question, but I remember the answer. The answer was, because we live in a knowledge economy. Being a curmudgeonly sort of fellow, that got my back up. I said, you mean my grandfather lived in an ignorance economy? That's, of course, not what the person meant, but that set me thinking about what is it that's different?

While it's probably true that there's more knowledge today, that remains an open question. Perhaps one thing that is true is that there's more knowledge about the way in which we're making use of the knowledge and the way in which we're commercializing knowledge is changing. What's perhaps true today is that, increasingly, companies are

trying to commercialize, or get profit from, knowledge that they're creating by selling the knowledge in a disembodied form.

Traditionally, we're used to thinking about measuring innovation, or measuring new knowledge that's created, by measuring the value of the goods or tangible objects in which that new knowledge is embedded. What I would want to focus my time on here is to argue that this is an interesting way in which things have changed. Increasingly, flows of disembodied knowledge, and payments for such flows, are an important part of our economy and perhaps are going to be even more important in the future.

This is related to a number of things that people have brought out already.

We call these markets for technology…markets for knowledge. When these markets for knowledge are working, it makes possible new types of business models for startups. Carl talked about this—this new web of the American economy, where established firms and entrepreneurial firms are co-existing and complimenting each other. I submit that the flows of knowledge—market-mediated flows where cash is being exchanged for knowledge—are an important part of this web and that this is also crossing national boundaries.

This is going to be an increasingly important thing that I hope this committee will talk about and we'll think about how to measure that in a more systematic way.

And last, I think one possible payoff of focusing on such market flows, or such markets, is that we have this issue of how do we measure all this intangible capital that's been built up. Well, when you buy and sell knowledge, that offers you a market test for what this stuff is worth, and that might be a way in which we can make progress on measuring intangible capital as well. Thank you.

CHAIRMAN SCHRAMM: Thank you. We have now about an hour to talk together. I'll just make a couple of comments.

First, somebody who is nameless—who works for the Government, in fact, your department, Mr. Secretary—said that at this point you now say: "we'll use the European convention. If people want to talk, they put their tent card up." That offends me in two respects. One is, I don't think we use the European convention. And second, I think if we're going to have a talk about innovation, we ought to have a talk in an entrepreneurial innovative way. That is, we should proceed without lots of rigidity. Put separately, you've all worked for tight chairmen and you've all worked for loose chairmen. I'm a looser chairman because I think we ought to get insight out of this discussion.

I'd say we've already heard some very provocative things, and if we open up I'd ask you to think about coming back to what it is we talked about that's measurable.

John starts us off. In a word John says of Wal-Mart, it is as much culture as it is anything else. I know I do violence to what John says, but I talked to him ahead of time and he said in effect at Wal-Mart it's culture.

Second, when Jim talks to us, his story is about the unexpected. So, if we're to set out to measure something, how do you measure that which comes upon you with a change of legislation or a bad customer who says I'll take you up on your joke?

Professor Chandy says to us that this whole process may be hugely discontinuous. You echo Carlota Perez, who I know has had a lot of influence at IBM. Is that really true? Are we still in a world of discontinuity in terms of innovation? Or, is all the data we see in front of us? Just look at your cell phone turning into a platform of data—continuously. Are we at a different perspective on innovation than Professor Perez might advance?

Mike pushes us to this view of the process of innovation. Process. Process. Process. Process, Process. Which again echoes, sort of, John's view that the culture is process.

And lastly, here's a daunting task. If in fact we don't sell stuff, we sell knowledge or ideas—and the evidence suggests we're moving in that direction—that may in fact point us—when it's time to measure—into a completely different sphere of where we're going.

Having said all that, I say let's go to it. You've heard some provocative things. Some of you would like to quiz each other and I'm going to play more referee than Chairman.

MEMBER HODGES: Can I ask you one question?

CHAIRMAN SCHRAMM: Sure.

MEMBER HODGES: No one has addressed the question of timing. Now this is rather a difficult subject and do you want an answer this afternoon or are we going to meet again or what?

SECRETARY GUTIERREZ: We'd like to do this as soon as possible. I would like to have a measure on… say if you could imagine a year from now a CNBC program is being kicked off—or one of these business networks—and they talk about this innovation metric that is just being rolled out. Now, a year makes some people very nervous because that's pretty quick, but the answer would be as soon as possible.

I think we're together for two years. Sometime between now and two years we should be rolling out this metric or these sets of metrics.

MEMBER HODGES: I had some questions at the very outset.

I'm inhibited sitting next to a distinguished professor whose specialty is productivity, but I was wondering how much of the measuring is similar to the measurements of productivity that come out of the Department of Labor.

Thirty years ago when I was in the Department of Commerce, we were as a nation…some petrified, some bothered, some curious—our productivity was not growing at all—and we were worrying about the Japanese…and everything in the world. There was no pro-productivity growth. All of a sudden—and it came from technology—the Labor Department talks about how our productivity has gone on.

I don't know what goes into that measurement that borders on innovation. I do know from the Chairman's reading material that he sent us— a very good memorandum, but two pieces…not your own sir. You referred to Harold Evans, and I refer you to his book They Made America: Two Generations of Innovation…not invention…but he makes the point that innovation has nothing to do with inventions. He has people who took other's inventions and he sights the history of America through innovation. I commend that to you. And, just to be difficult, the other article about entrepreneurial culture…I think, is the most important reading one could look at and take home with them.

I raise the question of whether we shouldn't be asking ourselves is our culture up to continuing the innovation that this country is enjoying. Because that raises a whole host of questions that you'll not want to deal with. But, you talk to people about technology—the experts are here—but are we going to be creating more jobs than we will have people coming… that we're producing out of our educational system who can either have, that either have nor the motivation to deal with it? Now that is as much a cultural problem, as I know, but that's a negative to this discussion.

MEMBER SIEGEL: I just wanted to say that I was struck as I listened to the examples and read some of the materials that the corporate executives provided by how many examples of innovation were user driven, consumer driven. I wonder if that's a trend and that's something we should be trying to document? Or, is that just an artifact of the set of corporations that are here?

MEMBER PALMISANO: I could support that comment.

We did a study last year—or year and a half ago—where we studied 750 companies around the world. Think of it as G7 nations dominated by U.S. based companies, but fundamentally the, the premise of the study is…is innovation important? Obviously yes. Then the next set of analysis went down the line—what are your best sources of ideas?

It's funny, especially for a company that has a very large research organization, like IBM—that spends a modest amount of money…six billion a year—that the number one input of ideas was employees or associates. The number two was customers and business partners in the supply chain or actual and user customers. They were the one and the two with the best source of innovative ideas.

Then, when you ask the CEO's of these entities how good they were at it…20 percent scored themselves—as a company, I mean, as a cultural entity, not as an individual—as very effective at taking advantage of these innovative ideas. So it says that—to your point Don—the sources are predominantly driven by our own work force and their interaction with the people that pay us every day, and that as a set of institutions or enterprises most of us think there's a big gap between our ability to understand that and capture it versus what actually exists within our businesses. It's a data point, that's the only reason I offer it.

MEMBER BERND: I think one of the other complicating matters in our assignment here is that innovation is so diverse. If you look at two extreme examples, we've got

continuous quality improvement at Wal-Mart working on internal operations—how do you measure that? It's embedded in the organization—versus innovation and new products, such as eBay or Google, which are totally new ideas and new concepts—obviously innovative. We've got very different channels of innovation and it's going to be difficult to try to ascertain where they are, particularly the ones embedded in existing organizations.

CHAIRMAN SCHRAMM: All right. This is the difficulty. I'm sorry, Art. Go ahead.

MEMBER COLLINS: There are two points. One of which has been talked about previously—that you get what you measure. So, it's important to measure innovation or attempt to. The second premise that I put forward is that innovation or technology for innovation's sake or technology's sake, probably isn't very important. It's only important when it's applied to meet some major need.

You're gathering data right now on productivity that probably would cover some of the innovation that inherently takes place in a corporation to make it more efficient. It's not necessarily the R&D for new products, but it's how do you come up with a more innovative manufacturing system. How do you answer the phones or maybe not even have phone calls come in and use the net that makes you more efficient.

Ultimately if you're gathering information on the United States, I would think one of the ultimate measures on how innovative we are is how much of the demand is for our products. The ultimate measure is market share. I would think that one measurement device by industry would be what percentage of the world market—you could look at the United States and outside the United States—firms capture, and what is the trend. Is it up or down?

We've clearly seen what happened when we lost innovation in the auto industry. It was immediately—or maybe not immediately but over time—reflected in the market share. I think that's a very important component in measuring the ultimate impact of innovation.

Now the second point I'd measure…as a thought, there's probably not any segment where we will require innovation more than in the health care sector. You just saw the most recent statistics that were published by the center for Medicare and Medicaid services that now predict by the time we get to 2016, we'll be spending in this country about 20 percent of gross domestic product on health care—about four point one trillion dollars. Everyone would recognize that if you look at the demographics that are in place, the average age of the population is growing, and there'll be more of a demand. I submit that somewhere in here— whether it's general measurements or measurements in health care—we need to start focusing on how we provide product innovation that will improve medical outcomes, but also improve the value that we receive for every dollar that we spend.

CHAIRMAN SCHRAMM: Dale.

MEMBER JORGENSON: I think that everybody here is aware by now of the diversity and richness of innovations. It's everything around us. But, I would like to introduce a distinction that I think can bring some order out of this diversity. That is, the distinction between effort and results. In economic jargon, that would be inputs and outputs, but let's say effort and results.

The traditional definition of innovation and what we talked about here focuses mainly on the effort to input. We think about R&D expenditures. We think about contacts with the customers—a very important source of innovation. Where it comes from. All the inputs that go into it. All the investments that go into it. And, of course, these are huge, as we all recognize.

But, I think we're beginning to recognize through this discussion of diversity and richness, that there's something missing. Mr. Hodges mentioned that a minute ago—namely productivity. Also, Art just mentioned that.

What I would like to do is to think about innovation in terms of results. What is the result of innovation? I think that the best way to approach that is to ask could we conceive of a situation, even hypothetically where there's no innovation, but nonetheless the economy is growing, and people are getting jobs, and so on?

Of course, that's easy to do. That was the regime before 1995. We had very, very low productivity growth. Lots of sectors were not experiencing increases in productivity. Some were declining in terms of their productivity. It's easy to think of that as a benchmark, and then you can say, “What is innovation then?”

Innovation is when output is growing faster than the input. In other words, where the results exceed the effort. That's the hallmark of innovation. This is not a new idea. It is in fact captured by the economic concept of productivity.

But now, I have to let you in on an inside piece of information, shared only among the economists. We don't usually talk about this outside economic circles because you want to keep the level of confusion up so that the level of employment of economists is—not high, of course— but is high enough. Let me dispel the confusion.

There are two types of productivity that economists refer to. I'm going to refer to one of those as headline productivity. That's what was recorded last week—on February 9th to be precise, a little bit more than last week. That was output per hour work. That is the number that is reported monthly by the Bureau of Labor Statistics. They have a large group of people that put those numbers together and a long tradition of work in this area.

The other concept is much less familiar—much less familiar. In fact, it's really known only among the economists. That is, output per unit of all inputs.

Output per unit of all inputs. Economists have a word for that—I'm not going to use it more than once— a phrase I should say...total factor productivity. Okay, I'm not going to say it again—output per unit of all inputs.

UNIDENTIFIED MALE: Is that TFP?

MEMBER JORGENSON: TFP, exactly right. TFP being output per unit of input.

There are a number of people around here who have a technical background. Not me, I'm an economist. But, that sounds a lot like the concept of efficiency that engineers have used for generations. Well, not quite, because that doesn't really capture the notion of innovation.

We have to think of something that captures the idea of quality that we've heard mentioned a couple of times by now. That is, the idea that all the things that enter into the inputs and outputs must be standardized for quality. The way we put it is to say we measure in units of constant quality. That's in so much economics that we're almost, almost at sea here.

Let me give you an example which I think illustrates this idea. In 1985, IBM and the Department of Commerce joined forces to measure computer prices. You can imagine the challenge, right? I mean at that time IBM had, I don't know, 99 percent of the market.

MEMBER PALMISANO: You had a very small -

MEMBER JORGENSON: Very small market share, right?

MEMBER PALMISANO: Anyone here from the Justice Department.

MEMBER JORGENSON: But as part of its continuing public responsibility, which we see manifest here in its presence of this meeting, IBM put together a team of engineers and economists to reckon with this problem and produced a new approach to measuring the prices of computers. Which meant that you could take the dollars that were spent on computers and convert them into constant prices or quantities, despite the fact that computers were incredibly homogeneous…heterogeneous. They went from vacuum tubes to semi-conductors. They went from the 360 to the 370 if I've got this in the right order. They went from the mainframe to the PC and so on.

By keeping quality constant, in other words standardizing the units, it's possible to encompass not only the traditional idea of efficiency, which captures what economists refer to as process innovation, but also the idea of product innovation…linking essentially this idea of input per unit of output to a change in the composition of the product—hopefully in the direction of higher quality products.

That example illustrates a success. If this committee were as successful as that combined effort, it would be quite satisfactory I think in every dimension because that is still the approach that is used in the national accounts. We still measure computer prices in the way that the team put together and incorporated into our statistical system. If you look in your report every quarter of the GDP, you will find information about computer prices.

The point is that it is possible to deal with the issues of quality. That's an extremely important issue, but total productivity or output per unit of input can be used to standardize the results and put them into common terms.

Now we come to the bottom line at last. What is the bottom line? The bottom line is that this concept can be used not only for the economy as a whole, it can be used for individual industries, it can be used for individual firms. In fact, I understand at Wal-Mart it is used for operating units within firms so that every unit has its own output per unit of input.

This is a unifying concept and it has the characteristic that I mentioned. Namely, rather than focus on the effort—the inputs—it focuses on the results. It focuses on what does the innovation actually generate, in a way that can be used to unify all the diversity and all the richness that all of us experience living in a very highly innovative economy.

MEMBER MENZER: I'd like to go back to what Art said on market share. I agree generally on market share, but the market share can look different because of your core business; you could have acquisitions, dispositions, et cetera.

I'd like to take it one segment lower and actually go back whether it's retail, service, et cetera, and really do a measurement on customer satisfaction and the customer experience. Because, that's really where the rubber meets the road. Are you showing that innovation? Is your customer's life better because of what you're doing?

That's the element that we measure a lot at Wal-Mart. We measure customer satisfaction every day, every month in all our stores and roll it up and are taking a look at a lot of the processes we have.

One of the complications is you have a lot of direct and indirect factors happening at the same time. If you have a number of innovations or merchandise in your store, trying to define which is moving that needle the most is a little tricky.

But the overall goal of customer satisfaction is a strong piece of it and would feed in some parts to market share, so I'd agree with you, Art.

MEMBER PALMISANO: If I could just add one point to that. Complimenting both, but Art's point about global competitiveness is very, very important.

If the ultimate goal of driving productivity or innovation is competitiveness, and the goal of competitiveness is job creation, as a society what we want to do is make sure we create better standard of living here, more jobs for our society, than other societies. That's fundamentally what we're talking about.

As a company you want to create more wealth to reinvest to create more jobs for your particular company. Therefore, Art, you made a very, very good point, which is—and whether it shares the right measure or not—how do you measure the competitiveness of U.S. firms; i.e., cost structures and competitiveness. We use profit per dollar labor cost, but there could be others. So that you can truly set a benchmark.

Where are these entities that create jobs? And, you understand that government probably funds about 50 percent of the jobs in the U.S. economy…maybe 80 percent of the jobs in the European economy. But fundamentally the other half have to be generated off of competitiveness.

If we reflect on what the ultimate goal of this is, Mr. Chairman, which is that, as a society, we want to be more competitive than other societies. Because capital and intellect will flow to where there's opportunity. There's a construct to put this measurement against. At the end of the day if we're not improving our competitiveness, it doesn't matter how productive we are, money won't flow, jobs won't flow, intellectual capital won't flow to our part of the world. It will flow to some other part of the world.

MEMBER COLLINS: Can I follow up on that? Carl asked me in the second session to give an example of this whole question, collaboration outside the company, which I'll be glad to do. But I want to pick up on something that Sam mentioned, and tie it back into the government.

There are major advantages of measuring—in some common format—innovation. You do it in productivity, but let's just say we come up with one for innovation. We talked—when the team came out and was doing their interviews—about how this is about measurement. I think a lot of people have said, well, let's talk about measurement.

But let's also talk about what impedes progress. I think not only measuring the end result, but as we all do in our companies, identifying what is getting in the way to actually doing a better job is important. How we measure that is a good question. I think this is a tremendous opportunity to have a collaboration between government and government agencies and industry because we are all affected.

Our ability to innovate and our ability to be successful is increasingly tied to government policy. I'll just give you one quick example. I was on the phone with Andy von Eschenbach—who is the Commissioner of the FDA—before coming to this meeting. Interesting, most people think of the FDA simply as a watchdog that ensures that products are safe and effective. That is an extremely important part of their role. But, there was a paper put out by the Center of Devices and Radiological Health which governs the medical device industry—where I am—in May of 2006. It was talking about the medical device innovation initiative. Only one of the elements of the three major topics that they talked about really had to do with modernizing the review of innovative devices. They actually talked about how can government encourage innovation? How can they knock down some of those blockages to innovation?

I submit while you're measuring the end result, if there's a way to measure what is getting in the way of achieving that result as a precursor to having industry and government on active duty and work together. I think that would be a very good thing.

MEMBER BERND: I think it's also important that we look at innovation in our basic industries that support…for instance these gentlemen provide products.

We always talk about health care as being a cost to society. Innovation is not well measured in the provider's part of the health care industry.

If you look at government as a cost we need to be more innovative in those areas and measure innovative practices amongst our infrastructure costs to be competitive on a national basis and to sell more of our products.

It's the other side of the economic equation as far as overhead or the well general being of our own societies and communities, hospitals, government, transportation systems. All that innovation in those areas is also very important.

MEMBER CHANDY: Just to follow up on a few points that were made by Sam Palmisano and Art Collins on examining the international competitiveness of the United States.

Let's say in six months—or by the end of this afternoon—we come up with an excellent set of metrics for innovation. Will we have a good sense for how we are fairing relative to other economies in the world? Not necessarily. We'd know something about our economy. We wouldn't know a whole lot about how we're doing relative to others.

So how would we compare ourselves to other economies? We'd have to get a sense for how those economies are doing too. How would we go about doing that?

There are at least two options. One is to rely on existing initiatives that are already ongoing in other economies. The other is to do it ourselves, where we would not only measure in the United States, we would also measure in these other economies.

Both have their challenges. The existing initiative may not meet all of the high standards, I suspect, or may not be identical to the metrics we come up with. The Canadians or the British or the others may not use the exact same metrics. As we develop this, we may want to keep in mind what is going on outside. Or, are we willing to do the measurement on a broader scale, internationally, too?

SECRETARY GUTIERREZ: Actually, if I may, that's a great point. We have members here from the European Union, here at the meeting, and we are also in very close communication with members of the EU Government. It's an excellent point because you're right. We're not in a vacuum. The last thing we need is every country developing their own measure. So we'll take that on. Whatever we do, we'd like to have a sense of alignment or consensus for G7 or key countries. So it's a great point. Thank you.

MEMBER JORGENSON: Could I offer a piece of information that you should be aware of in this very respect?

The EU, of course, is just as concerned about these issues as we are. They have established a project to create measures of productivity—in the sense that I described it—for every EU member. Every one. On March 15th—not so long from now—these data will be released in Brussels at a meeting of the EU. A comprehensive set of productivity measures for each of the EU economies as well as for the U.S., Japan,

Canada, Korea, Australia, and a number of other countries, will be made available in a common format. That is an enormous opportunity for this group, because it gives us an opportunity to link directly to an international effort that involves our major competitors as well as the people that we cooperate and do business with—the people in the EU, the Canadians, the Japanese, and so on.

These efforts are not limited to industrialized countries. There's an effort underway in India. A similar effort is underway in China. One is about to be launched in Brazil and another one in Russia. As you say we're not operating in a vacuum. There is an established program of research to develop precisely the measures and innovation that this group will need in order to give the U.S. its proper place in this evolving international measurement scene.

MEMBER ESKEW: Also, we have in worldwide division of labor. Products are sourced in certain place and manufactured in other parts of the world. We have moved in this country from an economy of agriculture at the turn of the last century to an economy of manufacturing, to one of services. About 80 percent of our economy is based on services.

When we think about this worldwide division of labor and think about how we measure competitiveness versus other countries, it may be how we measure innovation and how we fit into that worldwide division of labor and where we lead. It's not just islands; it's also how we cooperate with the rest of the world in terms of innovation.

MEMBER COOPER: Can I ask a question? I wanted to ask a question of some of the CEOs who might want to answer this question. We've heard some different words used for what I think may be the same thing. Some people talk about the single…I'm going to ask the question "what is the single most important driving force that results in innovative products or processes in your company?"

It's never easy to identify one, but if we don't think hard enough to identify one, it might be hard to focus on what we really must try to measure.

I've heard certainly our Chairman mention that some of you talked about processes, some of you talked about culture. I've read in the literature about all of this. The term we talk about is business model. What I haven't heard this afternoon is incentive structure. I think that's part of culture. It's part of business model.

I would be interested in knowing if you feel in your organizations that you have the right incentive structures for your workers, especially those involved…although all would be involved in innovation. Do you have the right incentive structure to be able to move as fast as you can with innovation?

MEMBER PALMISANO: I'll start. I'll tell you how we do it. It's not meant to be a good or bad; it's just how we've done it.

On the inputs—I've learned a new term today, inputs—they are measured by patents. The inventors of the patents—we tend not to give any business process patents. We

measure, in our case, real inventions that are real breakthroughs versus process knowledge that people try to patent today—they get a share of the income. So, if you're an artist and you publish music, you get a piece of the action. And, that's calculated for—until you die.

There's great incentive to file patents. And the income—I forget the exact calculation, but I'll give out next week about four million dollars to these people who invented these things. Some will be retired. Some are active employees and it goes on until they pass away.

On the other side, we struggle.

That's easy. It's an input. You can measure it. We get three or four thousand patents a year. We have 45 thousand patents. They can generate so much income. It's a very straight forward process.

The other side—which is harder to do but we thought that it was important under the theme of everybody has a role in innovation—but the measure of innovation is productivity. We set the compensation pool for all employees and executives that's weighted 10 percent based on a productivity metric. Now, it's not a huge amount of money. I'm going to say, probably if I do the math, this year will be a couple of hundred million dollars. It's all employees, all executives, that's total, not equity cash pool. Not to get into too much HR jargon, but it's the actual dollars that are given out versus stock grants and those sorts of things. We decided that it was appropriate to do it three years ago to communicate to the entire population that they all had a role in innovation. It's something everyone could do either internally in the business model or externally with clients and customers. That 10 percent of the bonus pool swings up or down based upon their ability to drive productivity.

We measure the productivity, which is actually profit dollar per labor of cost, and we chose labor cost versus head count or full-time equivalents, et cetera, because we have so many complementary workers around the world that cost was what we thought was a better measure.

MEMBER COLLINS: You asked the question, what's the most important factor and you talked about culture, you talked about process systems. I think the most important factor is people.

The culture and the process only allows good people, innovative people, to do their best. I want to come back on that in a moment. I won't talk about financial incentives; we have similar approaches.

I would not overlook the non-financial incentive—the recognition. The ability for an individual's contributions—suggestions, innovation, that ultimately translate into whether it's a financial result, an improvement in market share, but more important satisfying your customers—to be recognized and publicly.

I reinforce that because financial incentives go only so far. They're very important, but that's not what it's all about. It's that people like inherently to do a good job and be recognized.

Last point on this, people. I think that if you look back on the precursor of innovation, so much of it goes back to education. If you want to track some leading indicators on "are we developing the people in the United States that are going to be capable of innovating," we ought to go back and have some very good metrics—that are basic—starting from pre-school through K through 9, through college. What are the graduation rates? How many engineers are we putting out? Et cetera, et cetera, et cetera. Give focus on that because without good people our innovation. Where we'll go— all these people that are running companies—we'll go outside the United States to get the people. That's not, long-term, good for the country.

MEMBER JORGENSON: I think that's an extremely good point.

If you think about the concepts of productivity as one involving all the inputs, people have to be right at the top of the list. So, if you think that measuring computers and dealing with the heterogeneity is difficult, imagine a standardized measure of people. Right? Mind boggling. Nonetheless, that's a standard calculation. The principles are very, very similar to computers. Needless to say it's pretty complicated.

The second point I want to agree with Art about is that it turns out to be driven by education.

Let's take all the different dimensions you can think of…just the ones that are available on the data that the Census Bureau collects. There's education. There's occupation, age, sex. Maybe you can get an indicator of experience…how long a person has worked in a particular occupation. It turns out that the change in the quality of people is driven by education, by more than any other single metric.

So, it seems like a terribly difficult problem in which there are all kinds of different metrics. If I were doing this for the Human Resource department of IBM today, I wouldn't propose anything quite this simple, but in fact if you look at it from 30 thousand feet and they were trying to look at a whole economy or look at a whole industry, education is a driver.

The question is how to measure the quality of people as reflected in their educational attainment. That is something that can be done with the data collected by the Census Bureau now. It is in the censuses that are taken every ten years and in the Current Population Survey, which is taken every month.

CHAIRMAN SCHRAMM: Dale, do we measure that now?

MEMBER JORGENSON: Yeah, we do measure that if you look at the Bureau of Labor statistics.

CHAIRMAN SCHRAMM: When I say that, I'm essentially asking, if you'll forgive me, a subset. Let's call it total factor productivity slash education. It's an output of our education system?

MEMBER JORGENSON: Right. Do we measure that on a routine basis? No, but there is in fact a project under way. We can't let anybody from BEA talk about this because they're not on the panel, but at BEA there is a project right now to measure the output of the educational system and compare it with the inputs. Yes, we do it now.

CHAIRMAN SCHRAMM: Will they build a backward series? Do you surmise?

MEMBER JORGENSON: Yes they will. In fact, there's a search now going back to the earliest available public records of the census, which are—if you're not going to copy the data yourself by hand but get an electronic record—maybe in the 1960s. You can go back that far. That's quite a ways, that's quite a historical record.

What we've seen is a tremendous upgrading of the work force.

Now you might say, is that something that we should pat ourselves on the back about? No. The Japanese have beat us. The average quality of an hour of work in Japan is higher than in the United States. That was not the case in 1960. It is now.

CHAIRMAN SCHRAMM: You guessed where I might be going with that question.

MEMBER MENZER: If I can go back to the people question and Kathy…I really believe it's the culture and much of it's empowerment. But, I think it's also allowing failure. Innovation is not always success. Learning from your failure may be the biggest part of innovation.

MEMBER BERND: In our organization, the most coveted award is our…annual interdisciplinary teams CEO awards for breakthrough innovations and business processes.

We've had teams that have worked on remote monitoring of congestive heart failure patients, development of disease management protocols for asthma and sickle cell anemia. The recognition they receive from their peers is really highly regarded in our organization. There is a monetary incentive too.

I think recognition—particularly of interdisciplinary teams—and awards for innovation are very important to the culture of our organization.

UNDER SECRETARY GLASSMAN: Can I just make a comment? Several of you have talked about how you have incentives for innovation. You recognize innovation. You have rewards for it. So, somehow you're identifying it. You know it. You know it happens and you know how much of it is happening because you're rewarding based on that. So, how are you measuring that?

MEMBER PALMISANO: This is what's hard, Cynthia.

It's the same issue we're going to wrestle with. That's why we're here. It's a very, very difficult thing to measure, so a lot of it is that you come up with—I think it was Mike Eskew said—project-based approaches, which we all are very comfortable with.

There's a business case for every project and we all understand that…project-based approaches. The business case that Jim referred to was 31 to 200, but it still worked out. There was a business case.

The next obvious one would be by project-based. The other things…we struggle so I don't think there's any insight in our learning.

For the past five years we've tried to come up with something that we could pay people on. And, you're right we're much more granular on our skill profiles because we certify skill categories at IBM, not just educational backgrounds. But, as far as where you could actually pay someone— because if you could pay someone, then you can, our belief, is that you can get cultural change. Because they can see where numeration is followed by behavior shift.

It's really hard. When you try to take this metric down to a department level, or down to—we can do it maybe at a—you know a small business for us is for a few billion—you could probably measure it and they'll have 15 or 20 thousand people. You could do it at that level. But if you're going to take it down to a 100-person department, with a budget of what ever it happens to be, it's very, very difficult to be precise because we don't capture the inputs.

Now this is—I think back to what Dale is saying—if you can't capture the inputs—like you can in the product code or like you can in an engineering spec for computer pricing…if you can't capture the inputs, it's very, very difficult to measure it. I guess that was the concept.

The paper called the NPR, but we believe I think—and I'll speak for myself—the business community would say you have to have metrics because without metrics you're not going to encourage investment. The key to innovation is the investment flows. If you don't put in the resources or you don't put the money behind it, you're not going to get the outputs. You have to be able to measure it to drive the right sufficient level of investment.

Which is why I think it's a challenge and why Carlos had the insight to bring this forward. As a society that's 80 percent based on services, we have to be able to measure this because we want to make sure that—whether it's skills development, educational quality, capital, capital flows, all those elements—those resources of this engine are at the appropriate levels.

SECRETARY GUTIERREZ: Let me ask of anyone here today…in your company do you measure innovation? Does anyone have a measure of . . .?

MEMBER COLLINS: A single measure?

SECRETARY GUTIERREZ: Or measures.

MEMBER COLLINS: Let me go back to something Sam just said.

I think, you'll find a whole series of measures of innovations that are principally the end result of innovation. Whether it's a more productive process that has been changed or innovated, or your service levels go up because of an innovative approach, or your quality has increased because of some innovative approach. That tends to be much more internal.

Most of our external—and then obviously cycle times are a big part of it…that works into all that.

The external innovation ultimately manifests itself in a product that the customer ultimately gets.

In our case, you have to prove one or two things. You have either improved medical outcome that can be measured over the episode of care. Or you have provided a more cost effective delivery of that care…again over that episode of care. There's medical outcomes on one and cost-effectiveness externally of the product on two. Then you've got, again, all these internal innovation activities that just make you more effective, efficient, and higher quality.

CHAIRMAN SCHRAMM: Jim.

MEMBER BLANCHARD: On that question, I've been kind of apologizing to Cyndi and others since the beginning of this project that we didn't have any real matrix or structure to measure innovation.

But, I went back while we've been talking today. Just a little story that I told—that's basically what I'll consider it—it's a story, and it's a story on innovation, but I think of it as more inspiration and perspiration than anything else. I went back and I surprised myself by realizing that I actually utilized, without knowing it, eight metrics. Let me just tell you what they were: time and timeframe, investment, value creation, market share, volume, scale, geography. The eighth one was longevity of the CEO, which is of little or no interest to anybody except the CEO.

And then, I could have used in that story ROI, ROA, employment or jobs created, shareholder wealth created, community progress and growth, customer satisfaction, and value to the customers in that same context. That's seven more…and eight…that's fifteen. And, I didn't really intend to give any metrics.

So all these are measurements that we utilize.

The answer to your question, specifically from Synovus, however is, we don't have any definitive measurement of innovation and hopefully out of this we're going to have some.

CHAIRMAN SCHRAMM: Anybody else want to address this question of internal measures?

Before we come to an end—anticipating the next session, which will be specifically on measurement—I want to ask Mike to talk a little bit about your concept of how UPS is helping to differentiate the whole supply chain. You used an example at lunch about how people now fashion their computer and how once upon a time computers landed at a middle market in bulk.

The point I'm going to here is…Dale has brought to us a view that we can measure the economy's innovation with factor productivity. Not the headline factor, not headline productivity, but total factor productivity. I'm wondering if there aren't nuances around this that actually compel us to look not just at that, but to some other factors. John raised this and, I think, what Mike helps us on is this notion of what the consumer gets at the back end.

What plays in my mind here, Dale, is that once upon a time all of us took Introductory Economics and we learned the example of how we shave. There was once a straight razor, and then there was a safety razor, and now we've got triple track or quadruple track—or what have you. The point is, the consumer has a different shaving experience. It costs less per unit. So right underneath…what the unit was, changed. The consumer, presumably, was happier…although I stopped at three blades. Mike, I think you gave a good example that might set the stage for this.

MEMBER ESKEW: What I spoke about at lunch was that we do live in an age of personalization. That is the consumer can reach into the supply chain. They can pull out what they want, when they want it, from whomever they choose. They're empowered. If you think about it…Sam, the first PC I bought was an IBM XT.

MEMBER PALMISANO: Thank you.

MEMBER ESKEW: …and they all looked the same way. They were all configured exactly the same. They were delivered by truckloads to IBM stores in those days.

MEMBER PALMISANO: Absolutely.

MEMBER ESKEW: And, they were all exactly the same. But now, you're able to reach into the supply chain and pull out…not last year's tie…not everybody's PC…but exactly what you want, when you want it, from whomever you choose. Those consumers are empowered and it is part of a worldwide division of labor.

If you think about our business—just to put things in perspective—30 years ago two percent of the GDP moved in small packages and the rest moved in large truckloads—LTL cargo loads. Thirty years later, that's now 12 percent. That starts to speak about that empowered consumer pulling things through the supply chain.

I think the metaphor for the world that I think about is the Internet. The Internet allows the smallest companies in the world—in their garages or their basements—to look like

the biggest, to act like the biggest and have the reach of the biggest in scale and scope. But, it also allows large companies, like us, to be able to act small—as if that's the only customer and that's the only package we have. I think, that's the age that we live in. That's the age of personalization we have to start thinking about in innovating too.

CHAIRMAN SCHRAMM: Would anybody like to add to Mike's observation? We're focused on what this innovation may look like at the end; i.e., in the consumer's eyes. Dale?

MEMBER JORGENSON: I would like to say that the story that we just heard is the story of our economy since 2001.

Remember the little economic history here? Beginning in 1995 productivity doubled. I'm talking about of course output per unit of all inputs. Productivity doubled. And then, it increased by another 50 percent when everybody said it had to go south.

I mean this can't continue.

You might say, where did that come from? You just heard the story, it came from the Internet. The Internet Web 2, is that what they call it?

UNIDENTIFIED MALE: That's the latest one.

MEMBER JORGENSON: So, that is the story of the last productivity resurgence. It's a huge story and it's one that we ought to be able to quantify.

MEMBER PALMISANO: And Carl, not to defend Carlota Perez, but if you believe her thesis, we're only in the first 20 percent of the cycle. We have another 80 percent to go and you don't have to accept her 200 years of economics.

SECRETARY GUTIERREZ: I hope she's right.

MEMBER PALMISANO: Pardon?

SECRETARY GUTIERREZ: Hope she's right.

MEMBER PALMISANO: Well, we're betting she's right.

CHAIRMAN SCHRAMM: We're going to test obsolescence in economic theory shortly. So, I think we should take our scheduled break. We're right on time. In fifteen minutes, be back here.

BREAK

CHAIRMAN SCHRAMM: We're all set to start.

We're going to now take up—for the balance of the afternoon—the question of how can we measure this. Already, you can tell this committee is being well chaired. We're into that topic and have been since the moment we began.

I'm going to ask Art Collins to offer some remarks at the beginning. Then we'll go through the list of folks who have prepared remarks on how we measure this.

Art.

MEMBER COLLINS: Carl asked me to talk about this topic of how do you collaborate outside of your companies for innovation.

John mentioned that at Wal-Mart one of the driving forces for innovation is to continually pulse their customers on what are they are doing well and what they could do better. Our business— unlike the pharmaceutical industry where you can put some very bright scientists, molecular biologists, chemists in the back room in a laboratory and come up with a new drug compound—is very different because most of our innovation takes place in concert with our engineers and scientists but working very closely with clinicians that are ultimately providing the therapy, because most of the products that we sell involve some type of surgical procedure. It could be very minor or it could be major. So, we are increasingly reaching out to find the most innovative, leading edge clinicians that literally are on the cutting edge of therapy. Not so much designing the device, but working on what's the application of this device and how is it actually being delivered to the patient.

We find that—going back to this international focus—while there are leading edge physicians in the United States, the United States doesn't have a lock on this. So we are making sure that we're staying very close to physicians in Western Europe and other parts of the world.

We have a whole series of metrics that we use to track both the time of the interface, the turnaround, the ultimate performance. But, I focus on this question of getting outside your institution to find out where innovations take place.

Last point that I was asked to comment on. We also do something that's a little different. We have a minority investment fund that right now is a little over 200 million dollars. We selectively invest in early-stage companies that can be born out of research institutions or they can be born out of a commercial approach. We're constantly trying to stay in touch with what the very small company is doing. We may ultimately be interested in acquiring them or we may take what we learn there and apply it elsewhere. It's not simply to make a lot of money on these investments. It's to keep your tentacles out and to understand what is taking place outside of your own organization, which I think is critical.

CHAIRMAN SCHRAMM: Great. Thank you, Art.

David?

MEMBER BERND: Thank you Mr. Chairman.

Picking up on the comments that Art made earlier about health care costs, I can say that different people have different perspectives on health care. About five years ago, I gave a talk to a group of physicians about the percentage of GDP that was being absorbed by health care. At the time, I think it was 12 1/2 percent. I told them that, at the present slope of increase, by the year 2060 it would take up 100 percent of the U.S. economy. I got a standing ovation! There are different perspectives at the top.

What I'd like to talk about today is a special part of a hospital institution centered around patients in ICU. I'm sure every one of us in this room has been in a hospital and at times you have had to visit patients that are very sick and they're in the intensive care units of a hospital.

These intensive care units usually have a ratio of one registered nurse to one patient, whereas on a Med Surg floor you might have one to eight. The costs are very high. The patients are very sick. The interventions are very complex. About 12 percent of the patients in any given hospital are in ICU beds and they make up 38 percent of the total cost.

There is in the practice of medicine a growing number of doctors—that are called either intensivists or are specially trained, usually pulmonary physicians—who take care of the critically ill in the ICU units. Unfortunately, there are only six thousand of these practitioners in the United States and it is projected that in 15 years we'll need 30 thousand of these practitioners.

At Sentara, we got a cold call from a small start-up company six years ago that talked to us about a new innovative process to remotely monitor ICU beds from a centralized location. Sentara, with an investment of 3 million dollars, became the first hospital in the world to monitor patients from a remote location.

This is 24 hour coverage. When we first started monitoring these patients, we set up in a business park outside of the hospital. It's staffed 24 hours a day by one physician and rotating shifts of intensivists with the use of two nurses.

Today, we monitor 105 intensive care beds in six institutions.

All data is stored digitally. There's a digital interface both for audio and visual connections with the patients in the room. Software developed by this company in partnership with Sentara, provides smart alarms which push data to the clinicians and anticipate crashes of patients that are ill or severe conditions. So, we get information before there is a crisis and an intervention has to be done. There's also the use of a total electronic patient record.

When you go into this remote ICU, there's a physician sitting at a console looking at three computer screens in constant communication with the nursing staffs. Information

is being pushed to him. If a patient is showing signs of having problems the monitors flash to him what's going on in situations so he can intervene.

When we began this process within Sentara, we brought in Cap Gemini, we looked at the total cost, the length of stay, hospital mortality base—from a base-measurement standpoint. Then we looked at the results after a two year period of time. In that two year period of time, we were able to reduce mortality across the hospital, not just in ICU's, by 15 percent. ICU length of stay was reduced by 16 percent. Variable costs in our units went down by 25 percent and retention of registered nurses in these units went up by 20 percent.

When we looked at it economically…in the beginning I was hopeful that this system would improve quality. I had no idea whatsoever if it would work or if there would be any economic payback. But, in fact, we had 155 percent payback on our initial investment through this remote monitoring of ICU's.

Today this organization provides coverage to 180 hospitals and five thousand intensive care beds throughout the United States.

That's good news and bad news for my segment of the industry. It's good news that they have grown, but the bad news is that there are six thousand hospitals within the United States with probably 50 thousand ICU beds and the penetration has been so slow.
I think it shows you some of the difficulties— particularly on the provider side of medicine. In the use of new innovative technology, it's very slow to be used in our industry.

In looking at this from an innovative standpoint, obviously it was a very innovative idea and new product. As we try to evaluate the effectiveness, we looked at various different measures.

First of all—probably most important—was measuring mortality. Did this reduce mortality in our institution? And, we have been able to say that 550 patients walked out of our institution after starting this technology who probably would not have made it in the past.

Second is customer satisfaction. We have requests from families in our various communities we serve asking to have their loved ones put in monitored beds, because they know they're having around the clock supervision of patients.

It's had a positive impact in our service quality—as I talked about—a positive rate of return and better clinical outcomes. It's also increased the retention of our professional staffs in the units that have the backup of these physicians.

So, as you can see, innovation and health care—unlike product development—is measured in very different ways and it can have an economic return.

Part of the fallacy in my industry is that people believe that higher quality costs more. I think—particularly in following Duran's teaching of continuous quality and improvement—we can show that increased quality is less costly in the medical environment. It's a unique example to think of innovation and how we've measured it within our own health system.

CHAIRMAN SCHRAMM: David, before we move on, where did that little cold call come from? What was that little company?

MEMBER BERND: Well it's interesting. I received a cold call through my secretary from a retired hospital administrator who said that he was representing this small startup company had an innovative idea. I usually don't take these calls, but it felt to me like it really had potential and I took the call. In that case, it's one individual who had a gut reaction to a new idea and thought it had implications that could be positive to the industry.

I can tell you it was very difficult to implement. In one of the hospitals we implemented in, the physicians threw towels over the cameras and it was very difficult to put innovation in the organization. Today it's widely accepted. We had to start off with physicians having five different levels of monitoring. Physicians could pick no monitoring to total monitoring because they saw it as a threat to their practice. Innovation in health care is sometimes difficult to put in place, but we persevered and it's really paid off for our community.

CHAIRMAN SCHRAMM: Dale, could you measure—presuming you had towel-less doctors—total factor productivity in medicine?

MEMBER JORGENSON: Yes. You probably know that the Center for Medicare and Medicaid Services maintains something called the National Health Accounts. They break down health expenditures into—again this is a very gross set of categories by comparison with the sort of detail you just described—the physician services, hospital services…like you were describing. You can put together a comprehensive picture of productivity.

Of course, something that's extremely important is the human resource that Art was mentioning. In health care, the physicians—including these very highly trained people like the ICU specialists you mentioned—are a very, very important part of the input, you might say,

What's the bottom line? Productivity in health care has been falling, while the rest of the economy has been booming.

This type of innovation that the two of you have been responsible for is a spot of light in a relatively dark picture. Because out there—in addition to these very highly sophisticated scientifically-based programs of medical care—there are practitioners. Those practitioners are finding that they are—as they like to put it—spending less and

less time with the patient, more and more time filling out forms. If they have a little IT, maybe they can get those forms filled out a little faster.

But the point is that productivity is gradually declining in this sector. That's a very important part of this cost picture that may drive the GDP do be 100 percent medical care within somebody's lifetime here. That would be a pretty grim picture.

But the answer is yes. It's challenging though. It's very challenging.

MEMBER PALMISANO: I'll just talk about one collaboration and then, kind of a metric collaboration— an example of kind of global collaboration and how it generates investment in the United States.

It's probably not understood by most that all these game consoles your children play with— whether it's Nintendo WII, or PLAY STATION 3, or X-Box 360—all the core technology is designed, developed, and manufactured by IBM. We're not associated with the gaming industry or tattoos or piercings. The way it came about is that we had some thoughts on the intellectual property to drive these microprocessors to nine computers on a chip versus two or four or one. It's first implementation was in the gaming industry. The medical industry was next for heart simulation and those kinds of things, radar systems, military uses. Toshiba and Sony actually funded the research and development manufacturing in Fishkill, New York. It's an example of collaboration.

You had to let go of the intellectual property. That's always a big debate. Around the IP—especially if you're the inventor—it's a little bit a debate. Once you got yourself comfortable with the fact that you can collaborate on intellectual property, it actually attracted probably a billion dollars of investment into a small suburban area outside of New York City called East Fishkill. It's an example of collaboration and also attraction of investment into the United States.

The point that I was talking a little bit about was measurement. I think it's really very important. I'm encouraged to hear that there are ways to measure this, because if you think about much of what goes on—especially from a business perspective,—you only invest in things where you have some confidence of return. Therefore, you need some metric associated with the confidence of return.

God love Jim for taking some risk and intuitively doing things that a lot of us spend a lot of time with models and everything else. His success story is much better than mine, so hats off to him. But, you need this metric. You need some kind of analytical toolset that says, “okay, now I need to be able to measure this.” And so, we’ve taken it down internally.

As an example, even our head of Human Resources is measured on labor cost. He doesn't like that—it's been a cultural transformation for him, like doctors and towels. He's not measured on how he hired 80 thousand people this year and trained them I could spend a billion dollars on education and all that sort of stuff that he has to do. He's measured on total labor cost that's IBM's, as well as all of our partners around the

world. Our head of IT, or Chief Information Officer in Business Process Work, she's measured by productivity not her budget—which is, I'd argue, significant. It's almost as much as R&D at six billion. She's measured on the productivity, not that she could make a budget of several billion.

We're trying to drive this thing down to actual numbers internally. Then we had this metrically established—that I told Dale we wrestled with— which was profit over labor cost dollar as a surrogate for productivity.

You do all this work around innovation, therefore we should be getting more profit per dollar of labor cost. The reason that's hard, is because you can have the cost of your people…put some benefits—and we can complain about health care—but throw some of that on there too. The reason it's hard is because, in our particular case, our core work force of around 400 thousand people—if you take people who support us in the form of doing manufacturing contract work or sell or represent our products around the world there's another 400 thousand people. So it's really about 800 thousand people that are dedicated to IBM every day in the world….that's the labor cost. It's not just half of it which is our people and the associated benefits in the remuneration systems. So, it's taken us some time to get there.

It's better. But, it's hard work is my point. Which is the challenge we're all going to face. Because if you start with this concept that you have to measure it to encourage investment, some of these things are pretty straightforward, other things are like labor cost. You take some time to get it precise. You can get it pretty close in our case.

Things that are harder are things like intellectual property, services provided across borders, patent flow, idea flows. All these things are fundamentally important in a services-based economy and are very, very difficult to measure. As you look, over time, at these intangibles…how do you value intangibles? If you want to encourage investment from a competitiveness perspective, you need to be able to value intangibles.

I don't think —it's the term that was used today—the inputs are enough. The fact that we spend X and get three to four thousand patents a year and set a record every year for the past 15 years on patents is quite honestly not enough as far as the intangibles, or intellectual property, or research and development.

Cross-border flow of ideas is another thing that's very, very difficult to do because ideas today are talked about. David talked about examples of local collaboration. I gave an example of a global collaboration just for that point. Ideas are collaborated on a global basis as well. How do you measure that and its impact from a societal perspective? It's a very hard thing to do.

In our pre-read that you guys all sent out…this NPR special report does a pretty good job, quite honestly, of identifying what needs to be done. It's a nice road map of what needs to be done as I read it. But we need to do the work associated with it.

One other thing, Mr. Chairman, and I'll be quiet.

It's about skills development. We talked a lot about education, but if we look to the educational systems of the past as the solution to what's required in the future in a services economy, we're going to find ourselves wanting. What I mean by that is, the system as it exists today is generating not enough for the tech industry or biotech, information tech…what have you…enough engineers, mathematicians, and scientists. That's a fact. They're also not broad enough, they're too narrow.

We've been working with a bunch of universities around the U.S. and the world to create a thing we call Services as a Science. If you're going to have a services-lead economy and if you're going to have services-led businesses, you need to have leaders who are trained in mathematics, engineering, social sciences and the other disciplines to be able to actually lead these kinds of entities.

It's very, very important. We've been lucky enough to get a bunch of universities to line up with us and work with us in this area. We think it's really, really important.

So there are two skill gaps. There's the one skill gap that we read about constantly that all of us in tech understand. That's the work we did on the National Competitiveness Initiative…the 100 million jobs or what's required for the next 100 million jobs…deep engineering types of math and science backgrounds.

Beyond that, though, there's a category that's not even being addressed, which is this Service as a Science. So, I think, we need…it gets back to the culture that we're trying to establish and the skill sets required to lead these kinds of future endeavors.

CHAIRMAN SCHRAMM: Sam, I mentioned IBM's pioneering work in Service as a Science in my essay that I circulated.

I think it's important for the committee to observe that from time to time we watch whole disciplines come out of places that you don't expect. For example, molecular biology was the invention of the Rockefeller Foundation and not any given university. And, it's interesting that it's IBM that will basically break through and create a new academic discipline. It wasn't the university coming to IBM, it's IBM trying to puzzle through how one creates, I use the phrase, a product-less company. It's all services. How does one measure, manage, and so forth? I regard that as very interesting work.

MEMBER PALMISANO: Thank you

What drove it is that at the end of the day, we spend too much money—say somewhere between 800 million to a billion a year between training the work force—training people who leave our work force to become teachers when they leave IBM as well as train the 85 thousand people we're going to hire this year.

I'd prefer, quite honestly, as a business to hire people that were trained.

There wasn't a computer science curriculum 30 years ago and we went out and convinced schools that they should teach Fortran and COBOL programming as computer science curriculum, so we can hire those skills. It's the same sort of thing. Business has a need for these kinds of skills and we'd prefer that the university system graduate those skills and we'll go hire as many as we can get our hands on based upon economic requirements.

The other side of it gets back to this conversation that occurs a lot, which this: as you go through this transition from an industrial society to a services society, you know you don't want to leave people behind. And, that's true. So you have to prepare people for the future jobs.

We argued in the NII that there's a wonderful thing in the United States called the community college system. We actually defined…oh gosh…I don't know how many hundreds of skill categories that are required for all these jobs that we'd like to hire people into. And, there was a mechanism to address this issue of a transition using the existing community college system to train people in network architecting—and all these detailed things that I won't bore you with—that are needs that we all have…not just in IT, but in anyone using IT or using telecommunications and those sorts of things…that could address and help in these transitions.

I think sometimes this is misunderstood. There's this misunderstanding that all business wants to do is go find some cheap labor some place in the world. That's not the case.

As Art said, we need skills and we need certain classes of skills. We go wherever we can find talent, because we have this need…this economic need to solve this gap, this skill gap problem. It's a balance between how much we think we can afford ourselves to invest versus what we would like the government and academic environment to produce for us.

It's a fine balance and it was also defined in here as an entrepreneurial ecosystem—which is the collaboration and innovation of business or venture capital in academia and those sorts of things. It's created wonderful companies like Cisco and Sun in my industry. It's the same sort of thing, I think, in a skilled development from that dimension of this thing.

MEMBER SIEGEL: Our charge here is to determine how innovation can be measured. It's clear because of certain policy changes and the rise of public-private research partnerships that there has been an increase in the incidents and intensity of collaborative research. That includes research joint ventures, strategic alliances in the technology realm, and other research partnerships with other private companies, and non-profit organizations such as universities and federal laboratories.

The question that I have for our CEOs is: precisely how do you measure the resources allocated to these collaborative relationships? And, how do you measure the outcomes of these relationships? Because, I think, that would be very useful information for the

committee as we struggle with how to measure an activity that we know is growing over time.

CHAIRMAN SCHRAMM: Kathleen?

MEMBER COOPER: Maybe you're not going to get an answer to that question.

That's one that can float around and we can think about.

I was asked to get us to think a little bit about where we are today in terms of our collection framework and how we collect statistics. Is it time to move on to that? Would you like to do that? Then we'll come back to your question, as we think through this.

As we think about the different proposals that we might put forward to measure innovation—and we've heard some very interesting ideas this afternoon—the challenge in the end will be trying to pull something together that we can all be satisfied with.

Let me say just a couple of words about the current framework and then a couple of more general comments about some of the holes in the data. Dale has mentioned a couple of those already, but I might mention them myself.

First of all I would say— as we think about what we ask for, or what we want to ask for—it's important for you as CEO's to recognize the way we get data. The way the key agencies collect data now for business is geared very much towards establishments not corporate entities.

That is a very real plus when it comes to such things as having regional data— regional information having a lot of detail for different establishments. It's not so easy for the reporter or for the business in this case. We have heard that before in our collection process.

Secondly—and this has been raised this afternoon, but I'll say it again because it's so important—goods producers—really the goods producing part of our economy and a little bit more—is very heavily measured and represented and dissected. But services, as you know, dominate our economy. We very clearly have a large hole there and one that is a concern as we begin this process.

I want to make a statement because I think there is a common misperception. Many people believe that nothing much has changed in terms of our measurement of the economy over the last 10, 20, 30 years. I can assure you—I learned this during my four years here at Commerce— that a lot has changed. Much more needs to change as we move through this process and think about ways to measure innovation and measure our economy better, but I think it's reassuring that indeed these, the people who work on this on a day-to-day basis—many of whom are represented here, the career civil servants—have indeed been working toward better measurement of our economy.

Those are things that are so basic in the data put together now. As we think through what we might need in the future, it's important that everyone recognizes that.

Then a couple of other points I think it's important for me to make—and again some of them referred to already.

One is in looking at the memo, Carl, that you sent to us as the charge for what we might do with this group, I wanted to make the strong point that I greatly appreciated the fact that you pointed out the important interaction between small and large firms in our economy. Often we focus—in policy debates et cetera—about only small firms or only large firms. But, it is very important…that interaction is very, very important.

Small firms we think of as being ones that might be better at coming up with ideas. They're certainly accused of that. We don't want to say that. Certainly that's not the only place those very good ideas come from. With the ones I heard this afternoon…I think that is overstated for sure. Large firms are certainly well known for being good at the process and at diffusing those good ideas throughout the economy.

To focus on both, I think, is awfully important and will be the only way we get the kinds of clear measurements that we need about innovation.

I agree with what's been talked about—what you mentioned in your memo and what we've decided to start calling TFP rather than pulling out the whole total factor productivity—but, if that is a measure that we want to focus on more, then people need to understand it better. It's rather fuzzy and not complete and very slow in being released. That's the reason we get the headline focus on labor productivity. It would be helpful to allow us to make some comparisons with other countries and I think that's a big advantage of focusing more resources on that measure and making it more available.

Do we need to drill down to the industry level if we go that route—total factor productivity? Absolutely, because as long as we just look at the big broad measure, it will remain so amorphous that none of us will feel comfortable using it. If we get to the industry level, at this point there are very significant delays and service sector holes that need to be remedied within our structure.

The fourth item I would mention…or question I would raise is, do we need more frequent direct measures? I mean such things as R&D spending and patents, et cetera. In my book, at least, the answer to that is also a clear yes. It's another way of looking at what is going on in the economy—somewhat different and not necessarily as comparative across countries, but very important.

That alone will not do it because we need to focus on innovation outcomes. We've talked about inputs a lot this afternoon, but we want to focus on innovation outcomes, not just the inputs, to the extent possible.

So let me say one last point, or set of points. I've spent a fair amount of time in my life on both sides of these issues, both sides of the aisle. I've spent time as a measurer in my four years here and as a measuree having spent most of my life in large businesses. There are challenges that we need to think through as we put forward our proposals.

As measurers there were times when we certainly wanted to ask questions that many people wanted the answers to. We wanted to ask businesses questions. The prime example that comes to my mind is off-shoring and outsourcing. These were the sorts of questions we wanted to ask, but we knew that companies could not give us those answers. It's not that they didn't want to, but simply that the way we tend to ask the questions are not ways that they can answer those questions. That definitely would preclude us from getting too far down some of these roads. We have to be careful of that.

As a measuree, I know that it can be very frustrating to be asked the level of detail that has to get asked—especially at all these establishments—in order to get at what some of us may want to get at. This is a tradeoff and I think it's important that we consider that tradeoff or those sets of tradeoffs as we move forward in thinking about what measures we can come up with for the U.S. innovation process.

CHAIRMAN SCHRAMM: Thank you Kathleen. Before, Dale, we move to you…the Deputy Secretary would like to say something.

DEPUTY SECRETARY SAMPSON: I was going to mention that these are concerns that Kathy has been identifying for a number of years.

Under the Secretary's leadership, the President's 2008 budget request does call for significant increases in our budget at the Census Bureau for collecting data on the services economy, plus a significant plus-up at the Bureau of Economic Analysis to be able to collect data on R&D spending.

As you focus on those areas, we're trying to put resources behind that as well to be able to provide the support for what you're trying to get to.

CHAIRMAN SCHRAMM: Great. When we write our final report, you bet that the budget will do wild and crazy things, right?

DEPUTY SECRETARY SAMPSON: I don't know about wild and crazy.

CHAIRMAN SCHRAMM: Watch everybody come out of the fox hole and say no we didn't say that. Thank you.

Dale.

MEMBER JORGENSON: I'd like to bring to your attention a report which was just released today by the National Research Council.

Let me explain what the National Research Council is. Everybody around the table, of course, is well aware of what it is, but I'm sure some of the people in the audience might like to know. It's the research branch of the National Academies. The National Academies include the National Academy of Science, the National Academy of Engineering, and the Institute of Medicine. These are the honorary organizations that

conduct research under the aegis of a National Research Council on these areas—technology, science, and of course the very important area of medical technology.

This is a report of a project of the Board on Science Technology and Economic Policy, which I have the honor of chairing. I'm right now trying to unload that, but I haven't been successful so far.

The final report is entitled, Enhancing Productivity Growth in the Information Age. It is backed up by four supporting volumes that deal with various aspects of this issue of measurement and support of what we call the new economy.

The point of view of this report is very much the point of view that Carl Schramm expressed in his memo that he circulated to the Committee. We are living in a new economy.

If I had to date it, the beginning of that new economy would be pretty recent, around 1995. And, it was transformed totally around 2001. We just heard why when we talked about the character of the Internet and its pervasive influence.

So, the National Research Council undertook a study of the sources of the new economy, how to measure it, and how to sustain it. These volumes were edited by myself and Charles Wessner. Charles Wessner is here in the audience, a member of the staff of the Board.

What I want to do is to just summarize very briefly the findings and recommendations. The findings and recommendations section has been vetted in the usual way by the National Research Council…all kinds of referees and peer reviewers.

It is summarized on pages 17 through 59. Am I going to go through all that? No. The part that I'm going to focus on is the part that concerns measurement of innovation. That turns out to be very short—pages 57 to 59 if you'd like to read about it afterward.

Those of you who don't have copies of this, you can go to the National Research Council and search on STEP, S-T-E-P and you'll get instructions there for how to buy a copy. Some of you got some free ones here but we didn't have enough to go around.

What does this provide? It provides what a technical group would call a road map of how to institute a measurement system that would provide what we're looking for. It may not be exactly what we want to use for this purpose, but at least it's a starting point. It has all of the details. We may want to change it around and move a few things here and there, but I think that it'll probably stand up pretty well.

So, what is the challenge? The challenge of measuring innovation is that it is not included in our National Accounts. It's not there.

There are historical reasons for this. The National Accounts were developed in a depression era when the main purpose was to find out where we were. Were we

sinking? Were we rising? Were we getting out of the Depression? That was baked in and has remained for about 50 years.

The challenge today is that we are in a totally different situation. The success of our monetary and fiscal policies has been such that the emphasis now has to be on growth. That's what we're here to discuss. That's what innovation is all about.

We have to think of how we're going to bring about the regular reporting of measures of innovation like output per unit of input.

What this report proposes is that we create a new architecture for the U.S. National Accounts.

What would an architecture mean? Obviously, it's not the National Accounts. It's a map. It's like a blueprint that you would use. In terms of people who have managed construction projects, it's pretty close to the one that you would give the contractor. In other words you'd give it to the people who are actually going to do the measurement so that you have enough detail in the instruction set to give them a pretty good idea of what they're going to have to do. This is laid out in the section from 57 to 59.

The key idea is that the National Income and Product Accounts—the productivity statistics and the flow of funds, which we've talked about here in terms of profitability—should be constructed within a unified framework. In other words, put together in a way that reflects the unity of our economy with all its diversity.

We have a very large economy. Nobody is deceived about that. It's highly decentralized and so is our statistical system. There's not only the Department of Commerce, there's the Department of Labor, there's the Federal Reserve Board. The whole list of statistical agencies—and this doesn't include all of them—is the one that Patricia circulated for us.

What was it?

EXECUTIVE DIRECTOR BUCKLEY: Thirteen majors.

MEMBER JORGENSON: These are the major agencies. But there are others. These people are all working more or less independently. You might say, they are dealing with subjects; Justice is dealing with justice, and the Environmental Protection Agency is dealing with the environment, and so on.

Let me give you an example. BEA and BLS put together measures of industry output that would be inputs into a productivity calculation—like the service calculation. BLS puts together the numbers for the productivity statistics, output per unit per hour worked. BEA puts it together to put together an industry breakdown of the GDP, the Gross Domestic Product.

These people are dealing with the same numbers, right? So, they get the same answer. Uh-uh, no, no. They have slightly different conventions, slightly different sources. The results don't agree.

Of course, economists have a field day. They publish articles saying, look, the BLS doesn't agree with the BEA. Where are we? What's going on? …and, so on. It's an enormous source of amusement and entertainment.

The point is that it's very confusing to policymakers. They want an answer. They want a measurement.

Imagine if you were managing a business—people around this table are doing that of course—and somebody came to you with two sets of accounts and said, "this is produced by the comptroller and this one is produced by the CFO." And, you look at the bottom line and you say…"This one says it's ten and the other one is five!" Nobody would run a business on that basis.

You can't run an economy on that basis either. We need to have a unified architecture that will enable us to reconcile these different sources. You might say…"well, surely somebody has thought of that."

There's a book length version, it turns out. This book length version has a catchy title. The title is, A New Architecture for the U.S. National Accounts. Wow! Here it is in print, and it's thick. It has lots of details and talks about all of the issues that we've been discussing—like Human Resources and how to measure capital and how to put it all together the way that Sam is trying to do for IBM into a unified accounting system.

What I would propose is the following recommendation for our Committee… that measures of output per unit of input for the economy as a whole and for individual industries—very important to emphasize that, and for individual industries to reflect the heterogeneity of our economy—should be included in our National Accounts and summary measures of innovation.

These can be combined with other innovation indicators at the firm level to provide a comprehensive picture of innovation in the U.S. economy.

So that's the recipe and the road map

We're not the only people thinking about this. The people in the European Union have already been thinking about this for quite a while—inspired actually by work done in the U.S. And, as I mentioned, on March 15th they are going to release a set of productivity measures that would be a comprehensive measure of innovation at the industry level and the aggregate level for every member of the EU.

On March 15th you can download that from your website. Now how are you going to do that? You're going to search on the following acronym—sorry, about acronyms—EU KLEMS. What is EU? EU is the European Union. That's not hard. KLEMS? What's that? That's Capital, Labor, Energy, Materials, and Services, which are all the inputs that go into the productivity measure and, of course, you have to measure the output as well.

On March 15th all the European countries will have measures that go from 1970 all the way through to 2004. By December they will have measures that go through 2005.

This is really a recommendation that the U.S. join the parade…maybe even get ahead of the parade. Because we have in this country the best measurement system in the world, and the best data collection system—which Kathy described—and there's absolutely no reason why we can't be the world leaders.

CHAIRMAN SCHRAMM: Now this is the point in the afternoon when we get to talk in general about this.

In a sense, Dale makes a compelling case about the direction we have to go. I for one would think that there's little taste in my soul to resist that. That seems like a clear outcome.

The potential of this panel is that from many different perspectives—of people that work in and around innovation—there are nuances and, as Dale allows, other ways to measure.

To put it differently, if given we adopted this measure tomorrow—I want to turn back to you, Dale, the hypothetical you gave us at the very beginning—and we found tomorrow that the unexpected expansion of our productivity were to come to a screeching halt, what would we do? That becomes a policy question…now, what would we do?

I would suggest that it may be that the things we don't measure in total factor productivity, nuance issues, may in fact hold the key as to what might be done. For example, if we were to look at firm starts, it's an area, Dale, that is an absolute black hole. I date the revolution in the economy a little earlier than you, but that's almost immaterial. We have watched startup companies become a major factor in the American economy almost overnight. I recall what I said about Galbraith declaring them immaterial and unimportant. We are at a point now where happily, and I think largely because of this net back and forth, we are watching big firm productivity go in exactly the right direction.

We've heard earlier today from a number of CEO's that that's because, in part, they are—Art, you're doing the best thing; you have agents out scouting for new technology that might, in fact, be critical to the future of Medtronic—but we don't know how those firms get started. We know nothing about the lifecycle of those firms. There is zero data on conditions related to that.

That's just one example. I think a number of people—and I asked Mike to do this earlier… what's the consumer feedback to this? The consumer has been critical to the reformation and they have now taught our whole economy how to be consumers at a level which was unimaginable in 1990. You couldn't imagine the tailored product service available to you. We've actually now made the consumer king.

It's useful to go back to that hypothetical. If we were to watch total factor productivity begin to decline, it might not be as simple an issue as it might have been in 1990 to go fix it. And there is the potential for all of us to investigate, speculate, and worry

about…other parts of the economy that we don't capture there, that may in fact be much more pliable to immediate policy intervention.

Having said that, it's important for us now to revisit this issue. What are the important parts of innovation? We've started with this question that Kathleen asked, “how do you measure it within a firm?” I would ask you to branch out a little further and see what stimuli you get from outside that pushes you towards innovation, and on the other side of it, demands innovation. How do you read your markets? And as you read those markets, what does it suggest to you about a systematic way we might begin to measure that.

MEMBER JORGENSON: Well let me just respond, Carl, by saying that this is a perfect illustration.

Because, there were in fact two phases of the so-called new economy. The first phase of the new economy—which we didn't observe at the time because we didn't have the productivity numbers to do it—was concentrated in a very, very tiny part of the economy—three percent at most, two point nine according to my estimates—namely IT. What is IT? Computers. IBM. Telecom equipment. Software. And, of course, the raw materials, semi-conductors. A tiny, tiny part of the economy was what's basically behind the big resurgence that started in '95.

In 2001 the IT producers passed the baton. To whom? To the people that are using IT. You heard a very, very dramatic set of examples here of the service at UPS. Who would have thunk that those folks were turning into the big innovators? They were. Or Wal-Mart? Or the people that you're talking about managing these ICU's?

That was a sea change. We didn't observe that. We didn't see it. Why? Because, we didn't have the data. We didn't have a regular reporting system that provided that information. So, when…if we have a downturn or yet another upturn, we've got to be in a position to try to understand it. Not retrospectively five years later, but when it happens. That's your point and I agree completely.

MEMBER COLLINS: I want to go back to something that Kathleen said…and, Dale, you mentioned it.

A lot of the measures that we have now are measures in aggregate. To the degree that you can bring that down to industry performance, there'll be two major benefits.

Number one is you will be able to see the differences on how certain industries are innovating and being successful and those that aren't. But, measurement is only good if it leads you to do something about it. So the best practices of what is unique about—whether it's an industry or leaders within an industry… What are they doing differently that then hopefully could be applied to the other industries? My big hope is that that's going to lead us to some improvements in health care.

The second point that was mentioned is you'll have a technological breakthrough and that may come from different places, but then what's the application of that

technological breakthrough, and to what degree is that being implemented more broadly based? I think you could potentially measure that.

I just keep coming back to this…I think everyone's focusing on it—on the cost of health care. But, if you take a look at…and I'll use an example of Wal-Mart… just contrast for a moment going into a Wal-Mart store and going into a hospital. You basically know when you go into a Wal-Mart store about what the service is or the product is you're gong to buy. And, if you don't know going in, you certainly know it in the store. You immediately get the service or the product. You know what it costs. If you have multiple products to buy you go to the check out counter and it's scanned. No mistakes. You immediately have a bill.

By the way, in the backroom, that inventory has already been accounted for and taken care of. You are immediately paid. You, by the way, probably used a credit card that has all your information that travels with you, and you've got a credit rating.

We can do that in health care. All that's taking known technology and it's applying it into an industry. I'm just using health care as an example—to improve productivity, outcomes, customer care, et cetera. So that I think *that*—application and best practices.

The last point—and this is the last thing I want to say today—so much of what's going to need to take place can't be done by industry by themselves. And, it certainly can't be done by a government by itself. Some measurement on those first two categories, but some measurement is needed of how are industry and government collaborating to address this. I think we're all, I'm hard pressed to say what it is, but I think it would be very important. In our instance, how well is industry and the FDA collaborating. I think you'd probably have the Commissioner of the FDA be very supportive of that…and I know he will because I talked to him this morning. How well is NIH or the academies collaborating? We should be encouraging that, not discouraging that. If we can figure out how to measure that, I think it'll go a long way to helping address many of the problems we've talked about.

CHAIRMAN SCHRAMM: One of the things I think I've heard…my synthesis of where Dale was headed and what you offered Art…is that if, as Dale said, we could produce indices of productivity on an industry basis, it might in fact be signals to us as to where we ought to begin to look for better practices.

MEMBER COLLINS: Absolutely.

CHAIRMAN SCHRAMM: So, if we could do it, refine it—for example, we had it in public schooling and we had it in health care, or we had it in university research productivity, which happens to be one of my personal concerns from data that we've been developing at the Kauffman Foundation—these would be signals to us about how differentially the economy is behaving? And in the case of at least two of those measures, those would be canaries in the mine shaft. If productivity in schooling's going down, we might be concerned about its implications.

But, what I'd like to tease out are peripheral measures that we have views about…hunches about…that should be measured along the way.

Patents is clearly part of the vocabulary inside IBM in a very refined way that other industries or other companies don't pay that much attention to. Sam, you said an important thing. It sounds to me as a matter of policy you don't go out after business use patents. So you're trying to strive for a real measure of invention, if you will.

MEMBER PALMISANO: Yeah, the old traditional definition. It was a breakthrough that had an impact versus just textbook pages that were patented, you know for future trial lawyers. I mean, the point of it is that if you're…I was flippant, I apologize…

There's a bunch of work down here to reform the patent system that we're participating in. But, the point is, if you really are going to go drive innovation, the seed to that is the invention itself. There's not enough in the invention, but you have to have that kernel, that seed kernel to get it going so it starts to grow. And then you innovate around that core invention. That's the logic of it.

We've chosen to—from an internal perspective—to measure things that are truly engineering breakthroughs. And, that's harder in software than it is in semi-conductors and in the hardware business, but for fundamentals you can still do it. It's very difficult in services because of the form of methodology of business process patents. But, fundamentally, we felt that that's what we want to drive the outcome…the input to the innovation process. We're a big believer in this at the end of the day.

The challenge associated with it is, I would argue, one of motivation. It gets back to the measure again. If you take your patents or you take inventions, the cycle time for some things that are tied closely to the business is three, in our case, three to five years. In the medical industry, it's actually longer. If you take things that are advancing the science in our industry—the physics of semi-conductors—that's a longer cycle time. That's maybe seven to ten years. Or, the mathematics associated with software development—the pure math—that's a longer cycle time.

The reason why it's very, very important to be able to have measures of the intangibles is because you want to encourage the invention in an innovative society. There are a lot of short-term pressures that people would say don't do any of that. Our system is frothy with liquidity. The first thing you would do if you would take over a company that was intensive in R&D, for short-term efficiency, long-term effect, is you would scale back these long-cycle kinds of projects, which would have…you would never have things that have fueled the past several years if that were to occur. The core protocols around the technology— the thing called the Internet—that would never have existed if you would cut back on those projects. It didn't reach fruition for 20 or 25 years.

MEMBER SIEGEL: Carl, you had mentioned peripheral measures so I'd like to raise another issue which is essentially that the Federal Government doesn't have a monopoly on data collection.

The statistical agencies do not do a good job of tracking economic activity in embryonic or emerging sectors. One reason why that's problematic is that that might understate the contribution of entrepreneurial firms in the early stages of development of the industry. We don't really track economic activity officially until the industry itself is well defined and products capture a certain market share.

We know that there are outside agents in the private sector and non-profit organizations, like Autumn, who conduct surveys that relate to activity in those embryonic or emerging sectors.

I think the Committee should explore opportunities to cooperate with those agents who are collecting data on the industries that are not well covered by the statistical agencies.

CHAIRMAN SCHRAMM: It's a very, very good point.

As many of you know, Bloomberg— among others, and the very first company I started with—was a data company—publicly available data that no one ever consolidated. So there are very robust private data series that could be brought to bear.

To your point, you've used the word peripheral and you've mentioned entrepreneurial firms. It seems to me that, in a sense, what we may be talking about is the mainline total factor productivity trajectory, if you will. Now we're trying to tease out are these, sort of, peripheral data series that may be pointing to where that's potentially heading, if I get the drift of what you're saying.

Yes.

MEMBER ARORA: To build up on those, I think the idea of getting TFP or total factor productivity measures at the industry level would be a great idea…provided we do a good job measuring all the inputs into the industry.

One of the things that sounds paradoxical—but isn't—is that once you aggregate, some of these measurement problems go away. But you start drilling down, the errors become large. It's particularly true when we think about the role of intangibles. We do a really good job measuring stuff, but we're not doing a good job—but we could quite easily—measuring the contribution of intangibles—particularly purchased intangibles, when you buy technology or you buy services. As Sam knows, IBM's got a good business licensing and they make a lot of money on that.

It strikes me that this is one of the low hanging fruit that we can do at an official level to track what people are paying for technology, not just technology that comes in boxes, but technology that comes in the other form of disembodied technology, of software or even people. If we were to do that, we would have a lot more faith in the TFP measures at the industry level.

Failing which, there's a danger that we might get the wrong signals. Then, you might see some industry showing high productivity growth, but that's because we're not measuring things properly.

UNDER SECRETARY GLASSMAN: Thank you, I just want to go back to something that Art said earlier and that we heard from a number of the companies that we visited. An indicator that the company is innovative appears to be a growing share of a growing market. So my question is— and that would cover smaller businesses as well as existing businesses—is that something we should be thinking about as another type of measure that would be a broader indicator?

MEMBER ESKEW: You know one thing about measurement, Carl. We tend to achieve what we measure and sometimes with unintended consequences if it's too narrowly focused.

And so, you start to think about measurement with a balanced approach and with some kind of a balanced score card that does consider people…and we've heard a lot about skills development and education, the customers…and we've heard about standard of living, and internal…we've heard about firm starts, and R&D, and patents and financial—with perhaps things like TFP or measure with outputs and inputs. But, it is a balanced approach—as opposed to just one number in measures that appear to be balanced—all done the same way and done consistently.

There may be a way to avoid some of those unintended consequences that single measures have. Single measures are fine in simple tasks. Innovation is not a simple task.

There may be a balanced thought that goes with this.

CHAIRMAN SCHRAMM: I think that's very useful. In a sense, I'm hearing Mike tell us—I'm putting words in your mouth and I apologize—we should be a little innovative about how we think about this.

For example, one of the things I think is a very tempting target for us is, what is an industry? Along comes Google one day and we didn't even know we had it as a species. We didn't know we needed an electronic marketplace. Along comes YouTube and, I guess, we discovered we really wanted to watch people pump gas or whatever.

But, there it is. It consumes huge amounts of human capital. Or, maybe it's an opportunity cost for developing human capital— depending on whether or not you own a sixteen-year old daughter, as I do. But, there it is. What industry? When did we capture it? How do we know it happened?

I dare say these are dramatic examples, but in many smaller ways in health care things happen. A good definition of an entrepreneur is someone who brings to the market a solution to a need we didn't know we had. And, a lot of times it's a long, long time before we actually…I don't know...

Here's a good question for our folks from the government. Is Google in a standard industrial classification yet? Or is YouTube in a standard industrial classification yet? And if so does it sound like it makes sense to us? Patricia.

EXECUTIVE DIRECTOR BUCKLEY: There are actual census experts here. I'm not one of them.

My recollection is that there are categories that capture it. I remember companies, such as Yahoo, needed a place to go besides being grouped with the Yellow Pages. So, there are categories in Information Services which is one of the categories under the North American Industrial Classification—number 51 if I recall. With subsequent editions of the classification, there are new industry classifications.

Part of what you're talking about is product classification. I'd have to check at what point we are in implementation of the North American Product Classification. Because, here's where all the new ideas, the new products, the new services need a home to go to. That's irrespective of what industry they're produced in.

MEMBER PALMISANO: Carl. That's a very provocative point you raised, Carl. Maybe you did it for that purpose.

Because, what is it? Is Google a creative implementation of some technology to create a media company? Because all their income is advertising. Or, is it an information services technology company? So what is it? Right?

We could have this debate ad nauseam. Isn't that right?

If you do it on source of income it's a media company. If you do it on what they do—they use technology a thing, a vehicle called search…and today's spreadsheets and word processors and some small business apps that they basically give away for the advertising. So it's TV. It's radio.

I mean, what is it?

I think you bring up a very provocative point. These definitions that existed 30 years ago aren't going to be appropriate for what we're trying to measure in the future.

I assume that's where you were headed and I was trying to support you in that statement.

MEMBER COLLINS: Whatever it is, it's successful. It's taken a technology and it's applied it. It's global in nature. You can measure how good it is or how well it's performing—or U.S. companies are performing by their market share. You can measure it in a lot of ways.

I think that's a great case study if we would go back retrospectively and look at all the things that took place for that innovation. How much of it could have we seen coming? If we were measuring it, would we have known it was coming? And, how do we measure the success going forward?

UNIDENTIFIED MALE: And, it's defined a whole new curriculum for search engine designers— something that didn't exist.

CHAIRMAN SCHRAMM: I think, what we're talking about here are these peripheral ride alongs— that certainly have a notion of dolphins but I don't know enough about what goes on in the sea…there are fish, the pilot fish, and so forth.

If you think about the measure that Dale presented to us, total factor productivity, there are these— and Dale you're the expert I don't mean to speak for you…the point you make again and again is that it's IT that drove the new economy. We're starting to tease out aspects of the IT.

One of the questions—and I do mean to be provocative here Sam—is we keep watching and we keep getting more and more surprised because we, there's a Moore's Law which only goes to semiconductors, doesn't seem to be decaying. Actually it seems to be accelerating. But, if we hit the top of that, which is conceivable: When will we know? How will we know? If this is centric to TFP for some period of 15 years or so, it will be critical for us to have a sense of that.

MEMBER PALMISANO: This is where Perez comes from. She argued that the Internet and semi-conductors were like hydro-power and steel, or hydro-carbons and deep well oil in the automotive industry. The bubble has occurred, i.e., the Internet collapsed. And after every bubble that collapses, there's 20 to 30 years of true innovation applied for this core technology that drives massive economic expansion for the winners.

To your point, she would say that the core driver was this thing called a semi-conductor…that was got down to the personal level, very, very small…now a gameship level right. DARPA and MCI and some other tech companies—that just happen to be IBM—but some other companies got together and collaborated for the exchange of research information and created this thing called the Internet. So, it's these two factors that drove the bubble, the bubble now has collapsed, and now the true phase of innovation is going to occur.

So what does that mean? Well you heard it from Art. You heard it from Mike. You heard it from Jim. You heard it from David. This is the whole point of where this thing goes. It's not just an economic cycle; all economic cycles, cycle…of course they do. The point of this is that basically a technology is going to drive a 30 year expansion of an innovation cycle.

CHAIRMAN SCHRAMM: Query?

MEMBER JORGENSON: The way I would tell the story, Carl, is a little different.

I would say, it was an IT story until around 2001 and then it shifted. It shifted to UPS. It shifted to health care. It shifted to all the sectors that use IT. But that's 25 percent of the economy.

So formerly, it was highly concentrated and could hardly be ignored. A lot of people discovered it at more or less the same time around 2000…that it was IT. About that time, it was no longer IT. That's Carlota's point,

It shifted to innovations that were based on IT. But, they weren't based on the idea that semi-conductors were getting better at a prodigious rate. That was the story up to 2001. After that time, it was all the things that we've heard described…that the users were doing that was totally different. They weren't innovating in terms of technology—although IBM would be happy to help them to build better chips to do what they're doing. They were doing things that reflected their business innovation and making it more efficient and bringing out new products. So they're doing both process and product innovation, and productivity growth accelerated, even though the IT era in a strict sense was over.

MEMBER PALMISANO: During that same period of time the IT industry slowed to its lowest point, I think, in 15 years. That's a stark fact.

MEMBER COLLINS: But what you're talking about is the application of the technology.

I'll give you one other example to think about going forward, and you can recreate a whole industry in this IT area. Right now you can go on websites and find out the value of your home. They mine all this data that they get from tax assessors and recent sales of homes. You can get a picture of your home. That's nice information, but just think what would happen, ultimately, if you started to sell homes that way on the Internet…the way they've done other products.

You may have innovation completely change the competitive dynamic within a given industry. It may start off as one thing, but then continue to evolve and pick up additional applications. I think that's part of the innovation. It's not just the technological breakthrough, it's the application.

MEMBER BERND: I think another good example of that is the i-Pod. Is the i-Pod a revolutionary innovative product? It's a hard drive with a microphone and it plays music. But, it's totally innovative…in the packaging…the way it's delivered…the consumer usefulness. It's another real breakthrough, but it's applications of other knowledge and the technological base.

CHAIRMAN SCHRAMM: David, you raise a very good point.

To go back to medicine, suppose we're within minutes of—which I suspect in cosmic time we are—genomic tailor-made medicine. At what point do we stop saying that was silicate pressed on a chip? At what point does innovation itself move away from—what, Sam, I think Carlota's position is. Basically it's an industrial hypothesis… We may, in fact, be watching a cultural shift into a zone that we haven't been able to name.

But if that's the case, to come back to earth here, our task is to figure out if we can get some metrics that would be pointers to these large cultural shifts that express themselves economically. With a view that they would be good enough for us from a policy perspective here in Washington to be able to pull levers. Is this the moment where we expand government spending in university physics labs by 40 percent? Those are the types of questions that eventually we have to get to.

MEMBER CHANDY: One of the issues that I hear, that I suspect will be fairly important as we move forward in figuring out measurement, is: "what is the appropriate unit of analysis?

At some point, we'll have to collect data from real people on what's happening in various entities. Is it projects? It seemed like, from the conversations with the CEOs in the group, the way they measure innovation and returns to innovations is at the project level inside the firm. Is it the firm itself? Is it some sort of network of firms, along the lines of what Don was referring to? Is it an industry? These are important issues—Or is it some sort of establishment level thing?—where we collect the data and how we aggregate. What are we looking at—with the Google example being one—will make a huge difference as to what the answers are.

I'd be curious to get the input of the folks here on what that unit of analysis should be.

CHAIRMAN SCHRAMM: You know, of all the students in school and college right now, in college, two thirds report that they intend to form a firm before they retire. It could be as common to start a firm as it is to have a baby or to get married.

The query is the unit. Is the person equal to firm?

MEMBER CHANDY: The variance that we would pick up would be very different depending on what we do. If you look within an industry…for instance, if you compare industries and look at the differences and means, those are substantially smaller than the differences within an industry. You were referring to our best practices. For instance, there are a few Googles in the world and there are a whole lot of others. If you look at just the industry we will miss out on the Googles of the world.

But, at what level do we operate?

CHAIRMAN SCHRAMM: We're getting close to the end of the day. While it's winter here in February in Washington, there's a long summer ahead for all the talented staff in the Department of Commerce.

It's our job—isn't this the juiciest thing that ever happened to us? It's our job to talk a little bit now about when we reconvene. What is it that these folks will have with them that will answer questions and guide us in the next day that we spend chatting about this…with a view that we have to settle on metrics that will be helpful around all these wonderful questions that have come up today?

MEMBER JORGENSON: Let me just reassert my proposal, which is that our objective now should not be to actually implement by the next meeting. What we're going to do…it should be to have a road map. By a road map I'm meaning to refer to the kind of road maps that are used in technologically sophisticated industries like computers and semi-conductors where you actually have a look at how you'd actually do things and in enough details so that it would really spell out all the details.

This new architecture for the National Accounts is something that I put together with Steve Landefeld, who's the head of BEA, and Bill Nordhaus.

Those of you who are careful readers of the business page of the New York Times know that Bill Nordhaus was on the front page with a picture in the business page—not the front page of course, but the business page. He was described there as the world's most reasonable economist. We found that indeed was true. He was very reasonable. He worked with us very carefully.

I would propose that would be our objective. We really ought to try to put together a road map and then turn that over to the folks that are going to have to follow that road, hoping they won't run into any brick walls.

MEMBER COLLINS: I think it would be helpful to get a straw dog. I mean, to have another general discussion, I think, would not be as productive as reacting to a certain set of recommendations even though they may not be where we end up.

I'd also break it into several categories. You want to go back and far back. What are those key elements that foster innovation, even though they may take a long time to play out—like education—and where do we stand.

Then, there are some precursors to more close-in innovation: Is it healthy? Is it likely to come in some period of time? Then, obviously, you have how it is in the here and now.

I think there's a tremendous benefit of breaking this down so you can contrast parts of the economy or some industries that are doing it better than others, so we can learn from it and benchmark.

Finally, I think this whole question of taking what works in terms of technological innovation and to what degree has it been broadly disseminated. Because there are so many areas right now, coming back to health care that could benefit from what has already been implemented in other parts of the economy and just stay on information systems for a while. If you could come back and give us some categories it would be very helpful.

MEMBER BERND: I have a couple of suggestions.

One, I think the staff needs to look at is, are we going to use global indicators? Are we going to go down to specific industries? If so, how low do we go in each specific industry?

The other thing, Cynthia asked a very interesting question which is: are the innovative organizations more successful than your business segment? Obviously, I think, they are and I think if we can quantify that in any way, it'll help the U.S. economy to give good examples of what innovation has a positive impact on our various industries.

MEMBER HODGES: Not to be presumptuous, but if the thought is that we would work towards a road map for a new system of National Accounts or something like that, I

know that's a major, major project. Knowing a little bit about Washington there's a lot of bureaucratic fighting between the different people who are in the statistical business.

Is it worth—without knowing where we're going—sort of seeing if OMB, or whomever, would be receptive to a look at that subject across bureau lines? That's something that's going to take a while, but before you get it…maybe get permission or a thought that you could do it.

I don't know when it's time to have that conversation, but it's a tough one.

SECRETARY GUTIERREZ: I think it's a good point. It would be good to have a better sense of the scope of what we're talking about, but ultimately you're right. We can't do it ourselves inside of the Commerce building.

MEMBER HODGES: We would like to be able to make a recommendation.

DEPUTY SECRETARY SAMPSON: The convening of this group is something that the Secretary proposed at the White House. And so, this discussion has been vetted through the high levels at the White House…at the NEC, and the CEA. There is the need for this. That's what the Secretary proposed and there is an openness and a recognition that we need to have this discussion. Obviously, when you get more granularity about what you're proposing…yes, you do have to go back through an inter-agency process. But I don't believe that we need a blessing to go down this road. The Secretary's idea has already been confirmed by the economic agencies, and OMB is a part of that.

SECRETARY GUTIERREZ: I think in all fairness what you're saying is, if we come up with something that is so big that it requires that we turn everything upside down, we may be up against something that is a lot bigger than what we thought it was. I think it's a very fair point.

CHAIRMAN SCHRAMM: Dale, do you have a sense of the level of enthusiasm for the recommendations of the National Research Council?

MEMBER JORGENSON: Let's put it this way. If you go to the BEA website and drill down—I'm not saying you're going to get a pop-up as news or something like that, but if you go there—you will find New Architecture on the BEA website. So, there is already, at least, that much receptivity. It's part of the agenda.

Now, implementation is what we're here to discuss. What exactly is going to be implemented and why? That's something that has to be determined at a higher level, but I think it is something that has been pretty well received so far.

MEMBER MENZER: I would like to see us define the objectives in a very strict way, including all the input from the meetings that we've had to date. Then when we have a straw man, which I think is a good step, we have something to measure. Does it really align with what we're trying to do?

For instance, one of the opportunities we talked about…should it be international. I'm going to call it global. Should it be global measurements? If that becomes one of our objectives, then we now have something to test our ideas against. If we could get buy in to those objectives, then we can try various straw men and see if they align.

MEMBER PALMISANO: I would add that once we establish the objectives, we might want to inventory what we already have. We might have, as Dale says, a lot of this information already that we could then revise versus create.

CHAIRMAN SCHRAMM: I think that's a good point. Maybe a way to proceed is for us to iterate with you in writing, John, around the objectives.

I think we have implicit objectives emergent here. One is that it has to be global. If our brethren in the EU are already at the gate and if in fact one of our first orders of interest is judging ourselves relative to other economies, that's a settled issue.

Maybe the right thing to do is for us to iterate objectives and then to begin to move towards a straw man.

That might be built around the total factor productivity approach.

Then solicit from each of you—Kathleen I'll try this in writing—a test against those of you who are running businesses, to get a sense of how it is you create metrics to judge this innovation.

I'm sure after spending the afternoon here you're all going home with a much more sophisticated view of this.

Then, see what we might do—Don, to use your term—about peripheral measures. To Sam's point, it may be that a number of these potential peripheral measures exist in other public or other private data sets. We might be able to come to some system that might serve our objectives.

John, another objective we'd want—I would propose this as I iterate with you—is to have a system that's robust enough to tell us ahead of time—if we're watching—about trouble.

One of the things that strikes me, Dale, is we ought to articulate objectives—or at least a straw man around total factor productivity by specific industries. I think that will be a very critical issue in terms of understanding lots of interactions in the economy…where innovation is coming or not coming.

MEMBER PALMISANO: It's interesting…say from private sources. We actually have a study of seven or eight—not all seventeen, but seven or eight—industries that correlate innovative companies to share return rates and all the rest of that stuff and what they've done. But it's not exhaustive. It's not all industries.

I think—from private sources—you're right. We could in the university. We've worked with a lot of universities to put this stuff together, obviously. Maybe there is a source of some of this that we could just put into this distillery and see what we have to work with. Whether it's statistics that Carlos would be comfortable with putting on the front page of the Wall Street Journal…I wouldn't want to stand behind my numbers, but you know...

CHAIRMAN SCHRAMM: Yes, Kathleen.

MEMBER COOPER: And I would add that when we get to the point of a straw dog— we get some sense of how long it might take to implement these sorts of changes and get some sense of whether we might be able to dig down and make total factor productivity a little less amorphous.

Its amorphousness is due to the fact that labor has one category…and then everything else. But, if we could get to some of the issues—that you mentioned, Dale, and others of you have mentioned—to try to get a sense of what these other parts of other factors contribute, that would be helpful.

CHAIRMAN SCHRAMM: I'm about to turn this back over to the Secretary, but there's only one other issue we have to deal with…The enormous press of time on everybody's schedule here is such that if we don't actually set ourselves a time target—John, there's the real objective—this will drift and drift and drift. And, our economy will get stronger and stronger and stronger, but we won't know why.

So, Mr. Secretary, there's our day's work. We've taken on a bit of a burden by way of homework and I think we'll look to you to charge us—as the good professor you are—when we have to have our homework back.

SECRETARY GUTIERREZ: Thank you. I'll try to just summarize. It's been an amazing afternoon for me and so much of what I heard today was packed with insights.

My perspective on this comes very much from the standpoint of a business. Then I remember what Dale said about if this is good for running a company, then why shouldn't it be good for running an economy. I think you're absolutely right. If we're designing a measurement system for an economy, there are certain principles that should be very similar to designing a measurement system for a company or for a business.

As you were talking, it seems like there could be two separate objectives for a measurement system. And the more I hear you talk, I think we are talking about a system as opposed to a, a metric.

On one hand, there's this measurement system that can enable you to detect changes, to observe the economy and detect where it's going and be able to catch industries as they're emerging.

My experience from watching successful companies and having studied and watched real turnaround situations where companies have gone from— to quote Collins—“good

to great,"…and it seems like the measurement systems that work for a company—that really drive change—are those measurement systems that are designed to change behavior. In a company, at least, that's what we look for. I think every CEO spends 20 hours a day thinking about how can I change behavior. Those companies that have really broken through—now that I think about it—have all been focused or somehow surrounded by a breakthrough measurement system. It's an insight that perhaps came from everyone in this room, but it just tells me that we are on to something.

As we close this meeting, I am more convinced than ever that what we should be doing is developing a measurement system to measure innovation. There was worthwhile discussion about this as something that drives behavior versus something that just allows us to observe. Going back to the point, Dale, I continue to think that that is a valid principle. If it works for a company it should work for an economy. And in a company a good measurement system is one that provides direction to all of your employees as to what kind of behavior you want. If we could step back and think about the power of this….What if we developed some measuring systems that actually provided direction for the economy as to what kind of behavior we wanted?

What I've noticed here in D.C.—that happens very often—is the unintended consequences that someone talked about. You develop a law or you pass legislation that is designed to do something and the unintended consequences are that five years from now you realize it did the opposite. Measurement systems are pretty similar to that. We all can think of measuring systems that were designed to do one thing and behold, they did just the opposite when you look at them five years later.

We should look at this as what kind of behavior do we want to drive with our new measurement system. As I think through some of the examples…mortality, I'm sure that whoever came up with that measure—mortality as opposed to something else—probably drove all kinds of behavior. Customer satisfaction at Wal-Mart—that's a lot different than, say, let's measure daily sales. You're talking about a very different set of measurements and I think we should be shooting for that.

I am convinced that we are on to the right objective here, which is to develop the measurement system first and then let the policy follow, as opposed to spending time on the policy. If we can all agree to the right system with the right metrics, it should become pretty obvious as to what kind of policies we need to drive those metrics. What this meeting has done for me is just convince me that the goal that we have all set—which is metrics measurements—is the right goal.

I'm extremely excited about what we can do and very encouraged about the impact of this and how big this can be. I hope you see that as well and I hope you are as excited as I am.

We will go ahead and take a shot of objectives; I think it's a good exercise.

I'd like you to think about some of these practical aspects. I'm on the side of practicality here, so I'll always try to pull you back. Are we trying to change behavior or are we

simply just trying to develop a dashboard to observe? I think we should go for a change in behavior.

Somebody talked about industries and whether new industries are emerging and new industries are being created in front of us and we don't have a system to measure that. My sense is that if you ever are in a doubt as to what industry you're in—I think it was Andy Grove who said—just look at your invoice. Is Google what? What industry are they in? Look at their invoice. I think that will drive us too, because we are talking about economic entities; we are talking about businesses. Therefore, there are some units that can help us figure out where it is we're going from the standpoint of remaining practical.

Mr. Chairman, I am extremely excited and I am convinced that we are on to something. I want to thank you for your commitment to this. I know we're going to look back and be grateful that we did all this work and I know that you've got thousands of other things to do.

Before turning back to the Chairman, there are a couple of people that I want to recognize. Today, the National Governor's Association met and they decided that they're going to make innovation their top priority for the next two years. This is another way of supporting what this group is doing. I want to recognize the two heads of that association, the Chairperson, Janet Napolitano from Arizona, and the Vice Chair, Governor Pawlenty from Minnesota. We've got to recognize all these different inputs.

I also want to thank members of the Commerce staff. There are a lot of people who spent a lot of time working around the scene so that we can have this three hour meeting. Believe me, they worked a lot more than three hours. Someone used to say in my business, it takes six seconds to ask a question and six hours to answer it. It took us a long time to develop a three hour meeting, and if you could just…Commerce people could you just stand up for a second; we'd like to recognize you.

We'll stay in touch with our Chairman. We'll channel any answers, the list of objectives…we'll work with him. He, in turn, will communicate with the Committee. I can't wait until we meet next time. Thank you.

END OF TAPE